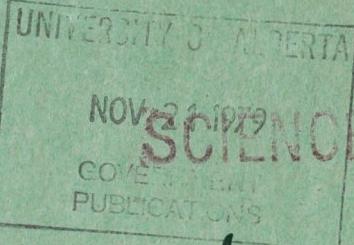


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# The Forests of Manitoba



Report No. 10

## FOREST RESOURCES INVENTORY

//  
by

C. B. GILL

Management Division

Forest Service, Department of Mines and Natural Resources

HON. C. H. WITNEY  
Minister

J. G. COWAN, Q.C.  
Deputy Minister

J. G. SOMERS  
Provincial Forester



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## Preface

This is the last of a series of ten bulletins summarizing the results of the ground and aerial survey work which was completed in 1956 in connection with the latest Forest Inventory of Manitoba.

For the purpose of the new Forest Inventory the Province has been divided (as shown on Map 1) into four zones based on climate, original vegetation, and predicted future use, as follows:

Agricultural Forest	Transition from Forest to Tundra Tundra or Barren Lands
------------------------	--

The Forest Zone may be defined as the area which is producing or is capable of producing forest crops and which for climatic reasons is, in the main, more suitable for the production of wood than for agricultural crops. The Forest Zone has an over-all area (omitting the three major lakes—Winnipeg, Manitoba and Winnipegosis) of about 113,000 square miles or nearly half the total area of Manitoba (less these lakes).

Based on the presence or absence of transportation routes such as railways, highways and water routes, the Forest Zone is again divided into an Accessible and Inaccessible Area.

The Accessible Forest Zone with an over-all area of about 64,000 square miles has been divided for Inventory purposes into eight Forest Sections based on physical geography and administrative boundaries, as follows:

Southeastern	Lowlands North
Winnipeg River	Nelson River
Lowlands South	Northern Mining
Mountain	Southwestern

Each of the Forest Sections is again divided into Working Circles which conform with Forest Ranger Districts, except in the more northerly areas where on account of their large size it has been necessary to subdivide the Ranger Districts.

The Inaccessible Forest with an over-all area of about 49,000 square miles has been divided into 20 Inventory Units.

Although a limited amount of the Forest Zone was inventoried before 1951, the main work was done commencing April 1st, 1951, from which date the Federal Government has reimbursed to the Province one-half of the expenditures incurred in forest resources inventory under the terms of an agreement with the Province pursuant to the provisions of the Canada Forestry Act.

A separate report has been published for the eight Forest Sections of the Accessible Area, and the Inaccessible Area has been covered in a ninth report. The present report summarizes for the whole province the information previously published in the section reports.

The contribution made by the many persons employed by the Forest Service in the trying and sometimes hazardous tasks of the field survey is acknowledged, as well as the services rendered by those engaged in the more tedious but equally important duties of compiling the information and making the necessary inventory maps.

The forest inventory could not have been carried out in a satisfactory manner without the assistance of the Surveys Branch which ran many miles of control line and of the Manitoba Air Service which transported and supplied the forestry and surveys branch field parties. Acknowledgement is made of the services rendered by the members of these two branches of the Department of Mines and Natural Resources who assisted in the forest inventory.

With regard to the text of the present report, acknowledgement is made to J. D. B. Harrison, the author of "The Forests of Manitoba," published in 1934 by the Forest Service, Department of the Interior, for parts of the sections on Climate, Forest Belts, Trees of Manitoba, History and Administration.



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# *Introduction*

This report will replace Bulletin 85, "The Forests of Manitoba," published in 1934 by the Forest Service, Department of the Interior.

The field survey work for the new inventory was done mainly during the years 1951 to 1955; the compilation and mapping was completed in 1956, except for some later adjustments. The method of survey used in cruising each of the eight Forest Sections of the Accessible Forest Area, and other information on the areas, has been given in the respective Inventory Reports, Nos. 1 to 8. The survey of the Inaccessible Forest Area, which was much less intensive, but considered to be adequate for the region, has been described in Inventory Report No. 9.

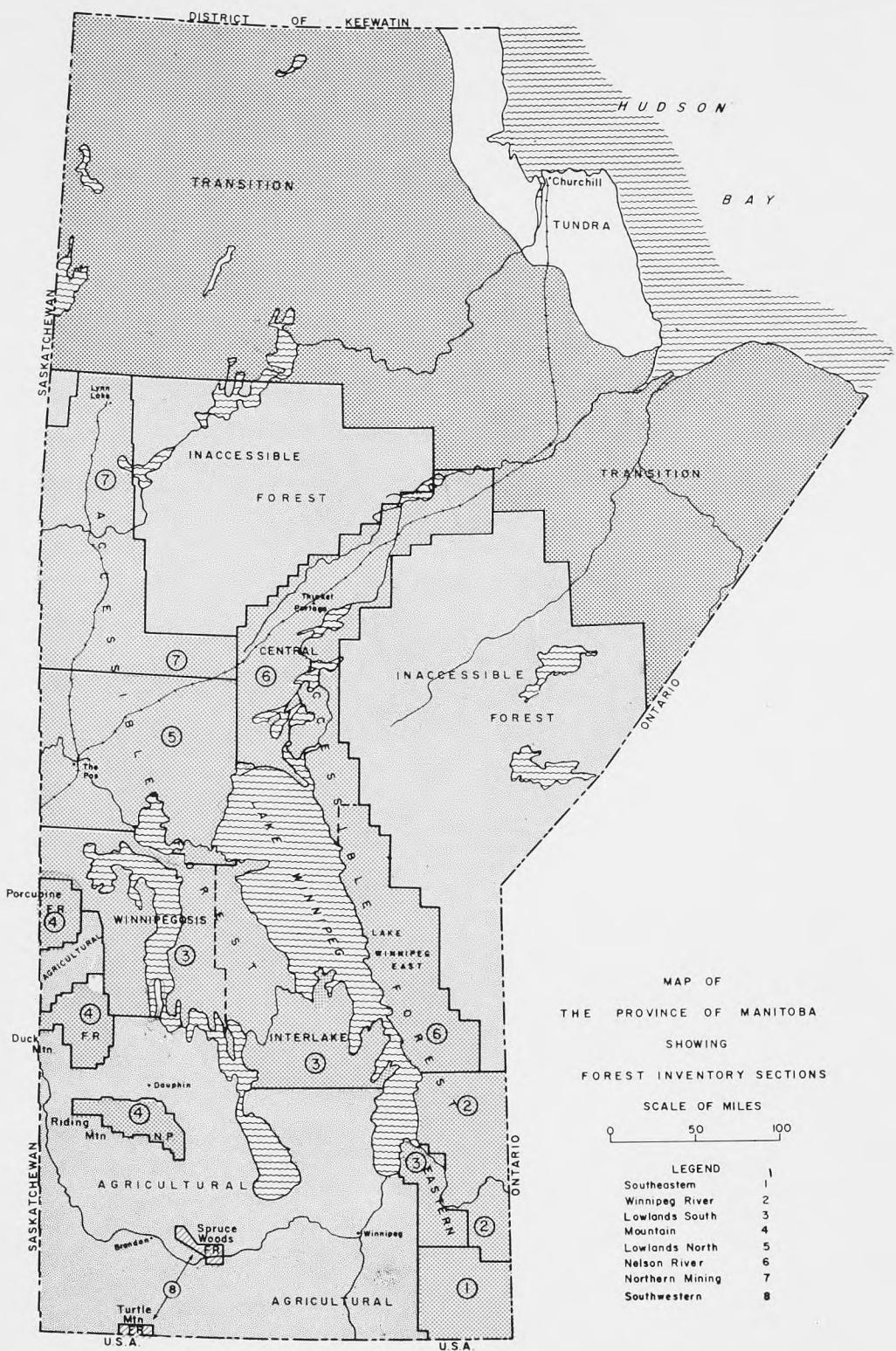
Tables 2 to 8 in the Appendix to the current report summarize the estimates of area and wood volume by Forest Sections for the area actually cruised.

The Forest Zone, including accessible and inaccessible areas, coloured green on Map No. 1, received complete aerial photographic coverage followed by ground cruising of representative portions of the area, from which compilation of areas and wood volume was arrived at for Crown land and patented land areas. Although Indian Reserves received photographic coverage, no cruising was done on the ground, nor were their areas and volumes included in tables of cruised area and volume—Tables 2 to 8. As these Indian Reserves



*Highway through mixedwood forest.*

—Dept. of Industry and Commerce



make up only about one-half of one per cent of the Forest Zone, the statement that the whole Forest Zone has been cruised is very nearly correct. The cruised portion of the Forest Zone is estimated to contain 93.0 per cent of the productive forest area of the province, 96.5 per cent of the total wood volume, and 98.4 per cent of the softwood volume.

The Agricultural Zone, coloured light brown on Map No. 1, which includes most of the farm land of the province, all the cities, and which has most of the population, has not been cruised. However, it was considered advisable to give approximate figures for forest area and wood volume for this zone, in order to complete the estimate for the province, using the best information available.

The Transition Zone, lying to the north of the Forest Zone, coloured dark brown on Map No. 1, and the small area of Tundra, left uncoloured, had no forest survey. Although there is known to be a certain amount of wood of merchantable size in the Transition Area, the amount is small, and in the Inventory tabulation the area is credited with no productive forest area, and, consequently, no wood volume. A classification of areas in the Transition and Tundra zones has been made from the best information available.

Tables 9 to 14 in the Appendix summarize the estimate of area and volume for the whole prov-

ince, by accessibility, ownership, and whether cruised or uncrusied.

An abbreviated summary of the merchant wood volume for the whole province is presented in Table A, and a summary of the area classification in Table B.

**Table A**  
*Volume of Merchantable Timber in Manitoba  
Expressed in Cubic Measure*

Class	Accessible cubic feet	Inaccessible cubic feet	TOTAL cubic feet
Softwoods (conifers)	5,671,827,000	4,071,522,200	9,743,349,200
Hardwoods (broad leaved).....	2,202,487,300	583,475,400	2,785,962,700
TOTAL.....	7,874,314,300	4,654,997,600	12,529,311,900

A description of the forests and the forest environment of the different forest sections of Manitoba has been given in the regional reports previously published. In these same reports, information has been given on the history, forest administration, and the use being made of the forests in the various sections.

Readers may find it inconvenient to refer to the regional reports, and for this reason it has been considered advisable to give in the present report a brief summary of the various subjects covered in more detail in the previous reports.

## Forest Resources Inventory

### Geology

The larger part of Manitoba is underlain by rocks of Precambrian age, consisting largely of granites and gneisses, but including also areas of more basic rocks in which valuable deposits of

minerals yielding gold, silver, platinum, nickel, copper, zinc, and other metals have been found.

Precambrian rock is overlain to the northeast and southwest by sedimentary rocks of Palaeozoic

**Table B**  
*Area Classification of Manitoba*

Class of Area	Accessible acres	Inaccessible acres	TOTAL acres	PER CENT OF LAND	PER CENT OF TOTAL AREA
Productive forest.....	21,909,686	13,710,185	35,619,871	26.3	22.2
Potentially productive forest.....	5,740,367	136,852	5,877,219	4.3	3.7
Nonproductive forest.....	8,058,107	33,295,998	41,354,105	30.5	25.7
Nonforested land.....	21,626,615	31,058,190	52,684,805	38.9	32.8
TOTAL LAND.....	57,334,775	78,201,225	135,536,000	100.0	84.4
TOTAL WATER.....	13,665,846	11,438,154	25,104,000	18.5	15.6
TOTAL AREA.....	71,000,621	89,639,379	160,640,000	.....	100.0

age, mainly limestone. The well known Tyndall building stone is quarried from one of the formations, while other types of local limestone are used in the cement, plaster, and paper-making industries. Southwestern Manitoba, including most of the region west of the Manitoba escarpment, has shale of Cretaceous age as its uppermost rock. Younger rock containing sandstone and coal are found in the Turtle Mountain area.

The whole of Manitoba was glaciated during (geologically speaking) very recent time, and the present surface reflects this event in its topography and soil. Some pre-glacial valleys exist, notably the Pembina, Souris, upper Assiniboine, and the valleys separating the Riding, Duck, Porcupine, and Pasquia mountains, or hills, but most of the streams, especially in the Precambrian area, have not yet had time to form well marked valleys, and the rivers here are found to consist of quiet lake-like expansions, separated by abrupt drops where the waters tumble over rock ledges.

The glacier on its gradual retreat left a till deposit of varying thickness consisting of a heterogeneous mixture of clay, silt, sand, gravel, and boulders, and an uneven surface, characteristic of much of southwestern Manitoba, and also of the Precambrian area. In the Precambrian area the bedrock is often exposed or close to the surface. When the glacier was static, irregular morainic ridges were deposited at the ice-front. In northwestern Manitoba, rivers confined within retreating ice left their trace in long, sinuous eskers of coarse material, and here as well as in other areas, sand plains resulted from glacial outwash.

The original drainage of Manitoba, before the Ice Age, was northeastward to Hudson Bay, but due to the ice barrier these channels were temporarily blocked and drainage was temporarily diverted into the Mississippi. As the ice-front retreated northward, a glacial lake was formed which had the Manitoba escarpment as its western and southwestern limit. This lake, known as glacial Lake Agassiz, which at one time covered all of the area shown on Map No. 2 as Manitoba Lowlands and Nelson River, and much of the Hardwood, Southeastern, Aspen Grove, and Grassland belts, or regions, had an important effect on present topography. A deep deposit of clay and silt was washed into the lake by rivers flowing from

the western uplands, leaving, on the drying-up of the lake, the present level surface of the Red River and other valleys. In the Manitoba Lowlands portion of the lake there seems to have been little deposition of sediment, but here the till mantle, consisting mainly of limestone material, was sorted by wave action, and, in some places, the underlying limestone rock was exposed.

Delta deposits of sandy material were deposited at the old mouths of some of the rivers entering the glacial lake, and on drainage of the lake, the sand was moved by the wind to form the dune topography visible at such places as the Carberry sand-hills. Ancient beaches of sorted sand and gravel are still well marked, being especially prominent at the foot of the escarpment, and in southeastern Manitoba. Lakes Winnipeg, Manitoba, and Winnipegosis are present day remnants of this great inland sea.

### **Topography**

Much of the southern half of the province consists of a great depression, or catchment basin, occupied in part by the larger lakes, and draining through the Nelson River in a northeasterly direction into Hudson Bay. The general level of this



*White spruce sawlogs—Duck Mountain*

basin is referred to as the first prairie steppe. Commencing near the intersection of the international boundary (the 49th parallel of north latitude) and the 98th meridian of west longitude, and extending in a northwesterly direction, there is a discontinuous chain of hills known as the Manitoba Escarpment. This chain marks the transition between the first and second prairie steppes, and includes the Pembina Hills in the south, and the Riding, Duck, and Porcupine mountains. It is characterized by steep slopes towards the east and northeast, and reaches elevations up to 2,700 feet above sea level. The elevation of Lake Winnipegosis is 831 feet, that of Lake Manitoba 814 feet, and that of Lake Winnipeg 713 feet. East of Lake Winnipeg the land rises towards the Ontario boundary to a maximum elevation of about 1,200 feet. Except for the hills of the escarpment, the surface of the province is of low relief, varying from the approximate dead level of the swamps and some of the grasslands to a low rolling surface where elevations of more than 100 feet above the surrounding terrain are somewhat unusual. The general northeasterly slope of the northern areas is shown by the courses of the Nelson and Churchill rivers.

A most important aspect resulting largely from topography is found in the main rivers traversing the Canadian Shield, particularly the Winnipeg and Nelson. These rivers have a large flow and contain many rapids suitable for the production of hydro-electric power. The Winnipeg River is already fully developed for this purpose. The first of what will ultimately be a number of hydro-electric developments on the Nelson River is already in operation, while work is proceeding on a power plant at Grand Rapids on the Saskatchewan.

### Soils

The origin of the mineral constituents of Manitoba's soils has been outlined above. Soil formation has also been influenced by climate and by vegetation. Grassland soils have a higher organic content than forest soils, and as a result are more fertile, although there is a widespread misconception that the opposite is true. Fortunately, good timber crops can be grown on soils which are quite unsuitable for the production of the ordinary agricultural crops.

Soil scientists have mapped Manitoba soils in zones based on climate and on the natural vegetation which results from the climate. Starting at the southwest and proceeding northeastward, we have Dark Brown, Black, Grey-black, Grey-wooded, and Podzol zones, and these soil zones reflect a gradual progression from mixed grass, to tall grass, aspen grove, mixed forest, and, finally, coniferous forest.

### Climate

The principal factor governing the distribution and nature of forests is climate. Climatic agencies particularly affecting the forest are temperature, precipitation, and length of growing season. As a general rule climate varies with change in either latitude or elevation. Local agencies which cause irregularities in the lines of equal temperature, precipitation, etc., are the large lakes of the Manitoba Lowlands, the chain of hills known as the Manitoba Escarpment, and the waters of Hudson Bay.

The temperature range occurring in Manitoba is very great, the extremes being from 100° above to 50° below zero Fahrenheit. January is the coldest month with daily minimum of from 9° below in the south to 30° below in the north. The warmest month, July, has a mean daily maximum of 80° in the southwest and 60° on the coast of Hudson Bay.

The length of the growing season is taken as the number of days between the last killing frost (29.5°) in the spring and the first severe frost of the autumn. The longest growing season in the province occurs in the valley of the Red River at the south boundary, where it averages 140 days. Towards the north it is greatly reduced, being only 115 days at the northern end of Lake Winnipeg. Accurate information is lacking for points still farther north, but it is certain that the season becomes even shorter. This reduction in the growing season is directly reflected in the reduced size of the trees, and partly explains the scrubby and unmerchantable character of the forests of the far north, although in this connection the influence of winds and drainage must not be overlooked. Available information on the length of the growing season, and the northwesterly trend of the lines representing July maximum temperatures combine to suggest that the successful establishment of agriculture

to the northeastward of The Pas may be prevented by the unfavourable climatic conditions. If this is the case, the only use which can be made of the better portions of the land in that area is forest production.

The average annual precipitation is somewhat less than that of the heavily forested regions of eastern Canada, and very much less than that occurring on the West Coast. In the southern portion of the province the average varies from 15 to 21 inches per annum. While the average precipitation over a considerable number of years varies for different points between the limits given, there is considerable evidence of a cyclic variation in annual precipitation which results in relatively dry periods of two or three years, recurring at about eleven-year intervals. This cyclic change has a considerable influence on the development of the forests through the conditions of high fire hazard which accompany the dry periods.

### **Forest Belts**

Map No. 2, Forest Belts, shows various regions of Manitoba based on the known similarity of growing conditions and the actual occurrence of certain plant communities as dominants. In establishing boundaries, it has seemed practical to combine both characteristic vegetation and physiography. Information used in making this map has been derived from several sources: the boundaries are not intended to be hard and fast, but the map should be useful when used in connection with the text. A comparison of Maps Nos. 1 and 2 will show the relationship between the forest sections of the inventory and the forest belts. Descriptions of the forest sections are included in Forest Resources Inventory reports Nos. 1-9. The following notes will serve as a summary of the principal characteristics of each of the forest belts:

**Aspen Grove**—This belt may be regarded as a zone of transition between the unforested Grassland belt and the true forested belts to the north, and its northern limit coincides with the southern limit of spruce, except for the isolated area in and around the Spruce Woods forest reserve which will be referred to later. The Aspen Grove belt is of importance principally from the point of view of agriculture. Its extensive tracts of fertile land are

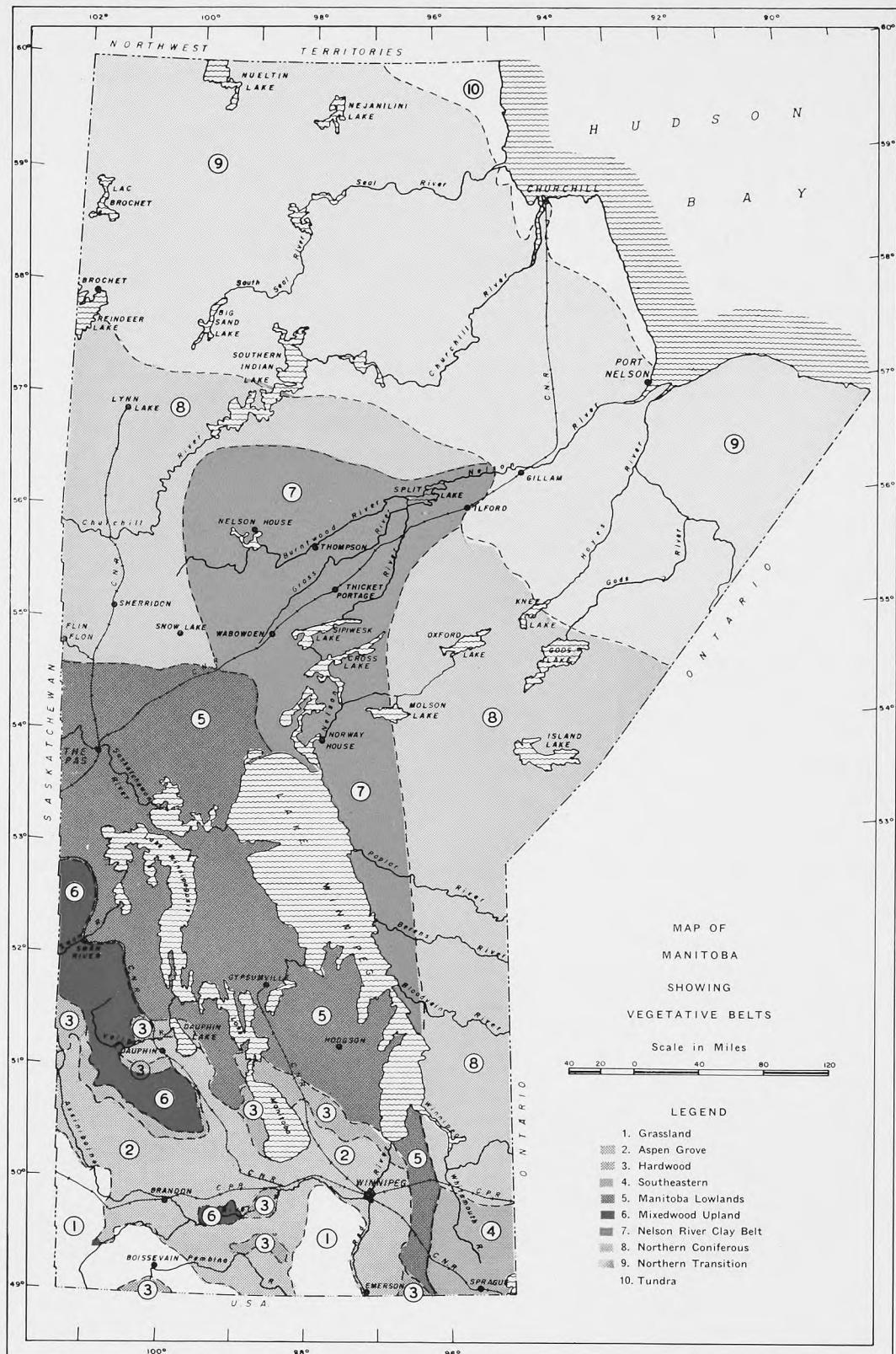
admirably adapted to grain growing and it has a somewhat less rigorous climate than the other belts. As its name implies, it contains numerous "bluffs" or groves of aspen throughout its area. Small quantities of Manitoba maple, green ash, white elm, and cottonwood are to be found on the banks of streams. Bur oak is sometimes found on well drained sites and balsam poplar on moist sites.

**Hardwood**—The elevated areas known as Turtle Mountain and Pembina Hills originally supported a broadleaf or hardwood forest; the former still does but much of the latter area has been cleared in the process of settlement. A zone of more or less continuous hardwood forest originally extended north and east of the Aspen Grove Belt. The dominant tree is aspen poplar but white birch is occasionally found. Balsam poplar occupies moister sites and bur oak may occur on well drained sites.

**Southeastern**—Two forest regions meet in southeastern Manitoba: The Great Lakes-St. Lawrence region and the Boreal region. The southeastern forests have a rather sparse occurrence of some of the tree species which are characteristic of the country further east, notably white pine, red pine, white cedar, large-toothed aspen, and black ash, and, for that reason, the area is usually included in the Great Lakes-St. Lawrence region. However, the main tree species are spruce, jack pine, balsam fir, tamarack, poplar and birch, which are characteristic of the Boreal Forest region to which the rest of Manitoba's forests belong.

**Manitoba Lowlands** — This belt occupies the country between Lake Winnipeg and the Manitoba escarpment, and extends north to the edge of the Precambrian region. The country is relatively flat and is underlain by limestone rock. The soils are high in lime content and in some areas are rather shallow. Low ridges occur alternating with poorly drained areas. The forests have the same species composition as occur in the adjoining forest belts to the east and the north, except that a few small stands of white cedar are found near Cedar Lake.

**Mixedwood Upland**—The Mixedwood belt is perhaps the most valuable in the province from the point of view of actual and potential forest production. Most of the area is productive and the inter-mixture of spruce and aspen which is prevalent indicates a good forest soil. Jack pine stands often



Map 2

have an understory of black spruce, and there are also good stands of pure black spruce. Pure stands of aspen and balsam poplar, sometimes mixed with white birch, also occur.

**Nelson River Clay Belt**—This area occupies the northern portion of the bed of glacial Lake Agassiz. The underlying rock is Precambrian, but both hills and hollows are to a large extent covered with a good depth of clay and silt which was deposited in the old lake. The better drained areas have a good white spruce and aspen forest where not disturbed by fire; in the wetter areas, black spruce ranges from good pulpwood stands to stagnated stands and open muskeg. On recently burned areas, a cover type of jack pine or poplar is found generally, although there is often a promising understory of spruce.

**Northern Coniferous**—The Northern Coniferous region has a Precambrian rock foundation, but since it was not included in Lake Agassiz, it has in general a shallower soil and of a different type than that found in the Nelson River Clay belt. Black spruce and jack pine are the most important tree species, and they may occur in pure stands or in mixture. There are also local areas of better soil which support white spruce, poplar, and birch. Balsam fir is found mainly in the southern part of the belt.

**Northern Transition**—The Northern Transition zone is, as its name implies, a region of transition

from forest to tundra vegetation. Tree form is stunted by the rigorous environment, and timber of commercial size is limited to well drained localities, such as the shores of rivers and lakes. White spruce, black spruce, and tamarack are the main tree species. This belt cannot be considered to have any substantial value for forestry.

### **Trees of Manitoba**

The tree species fall naturally into two distinct groups, which are commonly described as softwoods and hardwoods. It is more correct to refer to the softwoods as conifers, and to the hardwoods as broad-leaved species, since the relative hardness of the woods of the two groups is subject to wide variations. For example, the wood of jack pine is harder than that of the aspen, although the latter species is included in the hardwood group. All of the softwoods are cone-bearing, carrying their seeds naked at the bases of the cone-scales; all have needle-like foliage, except the Eastern white cedar, and all are evergreen except the tamarack, which sheds its leaves for the winter. The hardwoods have broad leaves, their seeds are encased in fruits or nuts, and in Canada they are all deciduous.

In comparison with the forests of other parts of Canada those of Manitoba are of simple composition. The common and botanical names of the most important species are shown in the following schedule:



*Jack pine hydro poles enroute to treating plant.*

Common Name	Botanical Name
<b>Softwoods</b>	
White spruce	<i>Picea glauca</i>
Black spruce	<i>Picea mariana</i>
Balsam fir	<i>Abies balsamea</i>
Jack pine	<i>Pinus Banksiana</i>

### Hardwoods

Aspen (white poplar)	<i>Populus tremuloides</i>
Balsam poplar (blk pop)	<i>Populus balsamifera</i>
White birch	<i>Betula papyrifera</i>

Among the softwood species of minor importance are tamarack (*Larix laricina*), Eastern white cedar (*Thuja occidentalis*), red or Norway pine (*Pinus resinosa*), and white pine (*Pinus strobus*).

The less important hardwoods include bur oak (*Quercus macrocarpa*), Manitoba maple (*Acer negundo*), green ash (*Fraxinus pennsylvanica* var. *subintegerrima*), black ash (*Fraxinus nigra*), and white elm (*Ulmus americana*), and there are also scattered specimens of basswood (*Tilia glabra*), cottonwood (*Populus deltoides*), and peach-leaved willow (*Salix amygdaloides*).

More than 90 per cent of the wood cut in Manitoba for commercial purposes is softwood. There is a good demand in industry for sound poplar and birch of the larger sizes, but the demand for the lower grades and smaller sizes falls far short of the supply. The following notes on the tree species of the province embody short descriptions of the trees with remarks on their chief uses:

**White Spruce**—This species is widely distributed but has its best development in the Mixedwood Belt. It usually reaches a maximum diameter of 24 to 30 inches, with a height of 80 to 100 feet, becoming mature at an age of from 80 to 120 years. Occasional trees reach a diameter as large as 50 inches. From this species comes most of the sawn lumber manufactured in the province, while, up to the present, a relatively small quantity is used for pulp, although the wood is well suited for this purpose. The wood is light in colour, straight in grain, and fairly durable. It is used for most kinds of construction work, both indoors and outside.

**Black Spruce**—Black spruce is found from the International Boundary in the southeast to the northern limit of tree growth. On the better sites

it reaches an average diameter of 10 to 12 inches, with a height of from 60 to 80 feet, at an age varying from 80 to 140 years. The same species occurs in muskegs, where the drainage is poor, in a stunted condition; under such circumstances it often fails to reach the minimum size necessary for its use as pulpwood, although the age of individual trees may reach 200 years or even more. This species supplies the great bulk of the pulpwood cut in the province. It is also used to some extent for the manufacture of lumber. The wood is slightly darker and heavier than that of white spruce, but the lumber is suitable for the same purposes. Its long fibres, density, and freedom from resin make it particularly suitable for the manufacture of newsprint paper.

**Balsam Fir**—Balsam fir, or balsam, as it is commonly called, grows on well-drained sites in mixture with white spruce and poplar. It reaches a diameter of 16 inches with a height of 70 feet in about 60 to 80 years. Its lumber is similar to spruce, but is whiter in colour, weaker, softer and less durable. Its long, tough fibres make it well suited for the manufacture of paper and a considerable volume is cut in Manitoba as pulpwood. On account of its susceptibility to trunk rot in old age, balsam fir should be managed on as short a rotation as possible.

**Jack Pine**—This tree is widely distributed on areas of sandy soil, and also occurs in great quantities in places where bed-rock is very close to the surface. It reaches maturity between the ages of 60 and 90 years, growing to a diameter of from 12 to 20 inches with heights of from 60 to 80 feet. The wood is quite resistant to the elements, and is, therefore, widely used for the manufacture of railway ties, and for telephone, telegraph, and power-line poles. Its useful life for these last-mentioned purposes can be greatly increased by treatment with wood preservative, which the wood easily absorbs. It is sawn into lumber of fair quality, usually in the form of dimension stock. Jack pine is used by the pulp and paper industry in the alkaline processes, and to a considerable extent in the groundwood process.

**Tamarack**—The future importance of tamarack is difficult to foretell. In the early days of settlement, it was the main tree used for railway ties and bridge timber on account of its durability. An



Mechanical loading of pulpwood.

—Manitoba Paper Co.

epidemic attack of larch sawfly in the early part of the century almost eliminated the green timber as a commercial species, although dry wood was taken out as railway ties, and fuelwood, long after the trees were dead.

At present, its main use is for fence posts. The species may have considerable importance in the future provided insect attacks can be prevented. It is now beginning to be used to a slight extent for pulpwood in the more accessible areas. Young tamarack occupies considerable areas in southeastern Manitoba which are too wet for any other tree species. Throughout the forest zone further north, its volume is rather insignificant in comparison with other trees; yet, on the ridges, near the northern tree line, it is larger and taller than the white and black spruce which accompany it.

**White Cedar**—White cedar suitable for commercial purposes is confined to the extreme southeast. It supplies a considerable number of poles and fence posts. Although the wood of this species is soft and weak, it is extremely durable in contact with the soil, and is, therefore, valuable for these

purposes. The few stands found in the northern Interlake region, and near Cedar Lake on the Saskatchewan River, completely isolated from the main range, are of botanical rather than commercial importance.

**Other Softwoods**—The other two softwoods, white and red pine, are so limited in their occurrence that they are of little importance as sources of wood supplies. They are confined to the southeast, except for a few acres of red pine which are to be found in an isolated location on Black Island in Lake Winnipeg. Red pine is expected to have a fairly important place in plans for the reforestation of derelict areas in southeastern Manitoba.

**Aspen**—Aspen poplar, locally known as white poplar, occurs in great abundance throughout the southern half of the province, dominating the forests of the Aspen Grove Belt, and finding its greatest development in the Mixedwood Belt. It reaches a maximum diameter of 24 inches and a height of 90 feet. It is subject to trunk rot on approaching maturity, and therefore, should be cut before it has attained full growth.

The wood is light, tough, odorless, easily split, and moderately hard when seasoned. It is used as lumber for construction purposes, in positions where it is protected from the weather, and is widely used as box material. Aspen pulp is used in the manufacture of softboard and insulating board. Aspen veneer is used locally in the manufacture of plywood. To date, the main use for aspen is in the form of fuelwood. Large quantities are cut for this purpose, mainly on farm lands, and to a lesser extent on Crown lands. The wood is used locally and also hauled or shipped to towns and cities, although its use as fuel has decreased recently, due to the competition of stoker coal, oil, gas, and electricity.

**Balsam Poplar**—This species, locally known as black poplar, grows in mixture with aspen, favoring the moister sites. It grows to larger sizes than aspen, and trees of over four feet in diameter above the butt swelling have been measured. In general characteristics the wood resembles aspen, and it is used to some extent for the manufacture of lumber and plywood, and also as pulpwood.

**White Birch**—This species is found throughout the forest zone, although seldom in pure stands. The tree reaches a diameter of 12 to 14 inches and 60 feet in height at an age of 60 to 80 years. Birch is considered to be a choice fuelwood. The better logs are sawn into lumber for use in the furniture industry, and, in the past, railway shims have been manufactured.

**Other Hardwoods**—White elm, green ash, and Manitoba maple are found as far north as the Saskatchewan, being usually found on river flood-plains. Bur oak grows on somewhat dryer sites, but finds its northwestern limit at the foot of the Porcupine Hills. Black ash is found east of the Red River, and extends northward across the Winnipeg River, and along the west shore of Lake Winnipeg as far as Gimli. Basswood occurs on the lower flats of the Red River and extends up the Assiniboine for some distance beyond Portage la Prairie. Cottonwood occupies similar sites but extends further west. These trees are generally found in quantities too small to be of interest from the commercial standpoint. The woods of all of them, except basswood and cottonwood, are stronger and harder than that of the poplars, and these harder woods are of some local importance in the farming

districts for the supply of posts, for repairs to vehicles, and for fuel. Oak, elm, and ash have been used to a limited extent by the furniture industry.

### **History**

In 1870, three years after the Dominion of Canada had been formed by the confederation of the original provinces, the Province of Manitoba was created by Act of Parliament. By the provisions of the Manitoba Act all ungranted or waste lands in the province were vested in the Crown and administered by the Government of Canada for the purposes of the Dominion.

During the latter years of the nineteenth century, the population of Manitoba increased at a steady but moderate rate, and exploitation of the forests was carried on principally to supply the needs of the new settlers for building materials and for fuel. Administration of the forests was placed with the Dominion Lands Branch of the Department of the Interior. Nothing in the way of forest management in the field was attempted at that time, the very limited field staff being concerned only with the cruising of timber areas applied for, the prevention of trespass, and the collection of dues. Nevertheless, the need for the preservation of wood supplies for the use of future settlers was recognized, under the Dominion Lands Act, by the designation of certain areas as "timber reserves." In Manitoba the areas set aside as reserves prior to 1900 included the present Turtle Mountain and the Spruce Woods Forest Reserves, the area now known as the Riding Mountain National Park and an area west of Lake Manitoba which has subsequently been reopened for settlement. The total area reserved was 2,562 square miles. In 1899 increasing interest in the forests of the province controlled by the Dominion, and in those of the Northwest Territories, was shown by the appointment of a Chief Inspector of Timber and Forestry at Ottawa, with a small clerical staff. This was the nucleus of the Forestry Branch of the Department of the Interior. In 1901 the first steps were taken towards the establishment of a scheme for supplying young trees to settlers on the prairie for the improvement of their farms and homes. Trees were supplied to Manitoba farmers from the Dominion Experimental Farm at Brandon till 1905, but subsequently the work was centralized at Indian Head, Saskatchewan.

The first forest surveys to be made in Manitoba were commenced in 1905, and were undertaken in order to determine the suitability of certain areas for permanent dedication to the growth of forests. The Forest Reserves Act passed by Parliament in 1906 established the old "timber reserves" as permanent "Forest Reserves," and also established the Duck Mountain and Porcupine Reserves, thus adding 1,951 square miles to the area of forest reservation. Subsequent withdrawals of areas for agricultural purposes slightly reduced the reserved area. The administration of the forest reserves was handed over to the Forestry Branch in 1907, but the Timber, Grazing and Irrigation Branch continued to deal with the disposal of timber in the forests outside of the reserves. In 1911 the Forest Reserves Act was rescinded and replaced by the Forest Reserves and Parks Act, under the authority of which the reserves were administered until July, 1930.

In 1912 the area of Manitoba was extended northward to the 60th parallel of north latitude and in a north-easterly direction to the shores of Hudson Bay. The most important forests thus added to the natural resources of the province were those to be found in the drainage basins of the lower Saskatchewan and the Nelson rivers. In the same year the Forestry Branch was reorganized and took over full control of fire protection activities in the province, both inside and outside the forest reserves.

In so far as Manitoba is concerned, experiments in the adaptation of aircraft to forest fire protection were commenced in 1921. The work was undertaken from a temporary base at Victoria Beach, Lake Winnipeg, where members of the Air Board staff collaborated with officials of the Forest Service in determining the methods by which aerial transport could best be used in the detection and suppression of fires. In the ensuing years an efficient organization was built up, in which flying personnel and machines were supplied by the Air Board and the fire-protection staff was supplied by the Forest Service. In 1923 the Air Board was abolished, its work being taken over by the Royal Canadian Air Force, of the Department of National Defence. The Royal Canadian Corps of Signals, of the same Department, furnished a number of wireless stations, together with the necessary staff. At the time of the transfer of resources well-equipped air bases were in operation at Lac du Bonnet,

Norway House, and Cormorant Lake, with sub-bases at Thicket Portage, Berens River, and Snake Island in Lake Winnipegosis.

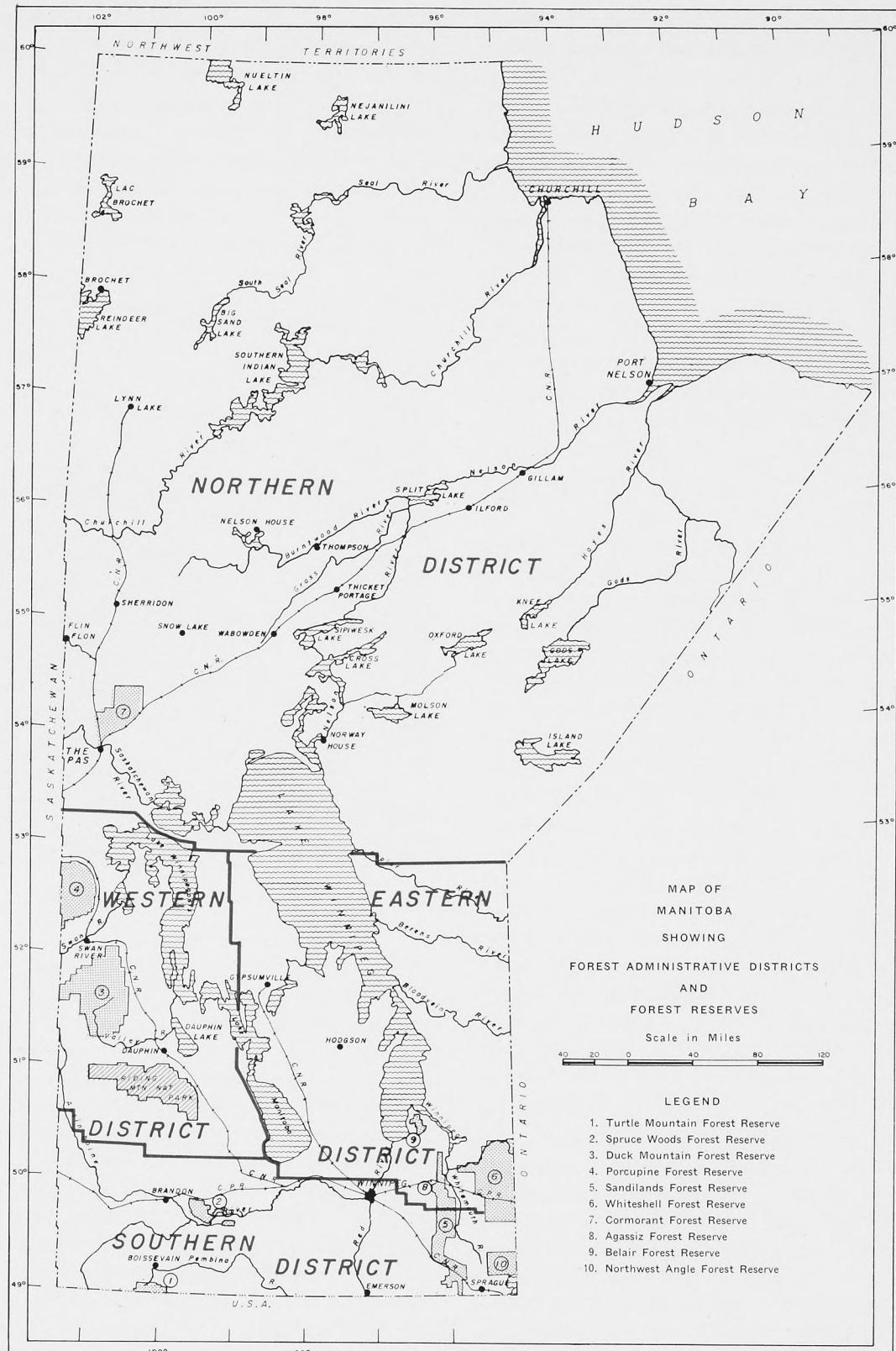
In 1923 the Sandilands Forest Reserve, containing 189 square miles, was established on the strength of information obtained from surveys completed some years previously. Meanwhile, in 1921, interest developed in the possibility of establishing the pulp and paper industry in the province. After prolonged negotiations between various commercial interests and the federal and provincial governments, the Manitoba Paper Company was formed, and a mill was erected in 1927 at Pine Falls on the Winnipeg River. To locate the wood supplies for this mill, and also to investigate the possibilities of further developments, extensive aerial and ground surveys were carried out by the federal government over many thousands of square miles of forest land. These surveys, which were carried out according to most up-to-date methods, continued from 1927 to 1929.

An agreement for the transfer of the natural resources to provincial control was signed by the Dominion and the Province in 1929, and became effective on the 15th July, 1930, the sixtieth anniversary of the creation of the province. Some months prior to the transfer, the Riding Mountain Forest Reserve was established as a national park, and it remains under the control of the National Parks Branch of the Department of Northern Affairs and National Resources.

### **Forest Administration**

On the assumption of control of the natural resources by the province, responsibility for all of the forests was taken over by the Forest Service of the Provincial Department of Mines and Natural Resources. The new service was recruited mainly from the trained personnel of the Dominion Forest Service, and from the staff of the Timber and Grazing Branch; there was, therefore, a minimum of dislocation of procedure in dealing with administrative matters. In establishing its forest service in this manner, the provincial government continued the policy of conserving and developing the forest resources which had been adopted by the federal authority.

The Forest Service of Manitoba is headed by the Provincial Forester, whose office is in Winnipeg.



Map 3

He is assisted by district foresters, each of whom is in charge of one of the field districts indicated on map No. 3.

The headquarters for both the Southern and the Eastern districts are at Winnipeg, those of the Western district at Dauphin, and those of the Northern district at The Pas. There are a number of local headquarters established in or near the forest reserves. The Whiteshell Forest Reserve is administered as a separate district, under a Forester, with headquarters at Rennie.

The forests both inside and outside the reserves are administered under the authority of the Forest Act (An Act respecting Crown Timber and Forest Reserves) 1930 and in accordance with the Forest Regulations issued by the Department. Authority for dealing with forest fires is obtained under the Manitoba Fires Prevention Act.

Methods of timber disposal from provincial Crown lands are based on principles established previous to 1930 by the Federal Government, although it has been necessary to make some changes in practice to conform with changing conditions. Except in cases where the land is to be cleared for settlement, timbered areas are not sold outright. Rights to cut timber are disposed of, limited to specified areas and for definite periods of time, but title to the land itself remains with the Crown.

Under the Federal regime, saw-timber was disposed of, mainly, under authority of timber licences. Timber berths were granted on a competitive basis; the successful bidder was given a licence to operate, renewable annually as long as sufficient merchantable saw-timber remained to warrant operation. Most of these timber berths have now lapsed, the original stands of virgin timber having been cut. Under present regulations new saw-timber licences may be granted for annual periods, renewable for a period not exceeding 15 years.

A quota of saw-timber is allowed to each bona fide settler at the regulation rate of dues for the construction of farm buildings. The amount cut under settlers' permit reached a peak about 1947, since which time it has declined, as little new settlement has taken place since that date. Permits may be issued to any applicant, allowing him to cut restricted amounts of fuelwood, boxwood, or pulpwood, for his own use or for sale. Permits may also be issued to miners, municipalities, commercial

fishermen, lessees of summer cottages on forest reserves, and to a number of other users of lumber or other forest products.

The timber sale is at the present the most important method of timber disposal, accounting for most of the saw-timber, railway ties, and poles, and a large percentage of the pulpwood cut. Sales are made by auction or tender and have a maximum period of five years. Special conditions are attached to each



—Manitoba Paper Co.  
*Pulpwood drive—Maskwa River.*

contract covering the different classes of timber which may be cut and the method of cutting.

Pulpwood licences may be granted to the owner of a pulp mill, covering forest areas from which pulpwood may be cut for the supply of the mill, but legislative approval is required in each case. A forest management licence may be granted to any pulpwood licensee, who, after a proper forest inventory, and the submission of a working plan based on sustained yield principles, has received approval of such working plan from the Minister of Mines and Natural Resources. The term of a forest management licence is 21 years, renewable for further periods of 21 years.

The organization for the protection of the forests from fire is based on the permanent staff of the

forest districts. The particular methods followed in each district conform to a general scheme for the province, but with such modifications as are required to meet the particular conditions existing in the district. The permanent staff is supplemented during the summer months by seasonal fire rangers, patrolmen, and lookout tower men. For the protection of the extensive forests of the Eastern and Northern forest districts, aircraft, operated by the Manitoba Government Air Service, are used. Dependence on aircraft for purposes of detection of fires has been reduced to some extent by increasing the number of lookout towers. At the time of writing there are 97 of these towers in the province. Communication between the towers and their base is by means of radio, although conventional telephone lines are also in use in the more accessible areas.

### ***Land Classification***

The permanent dedication of land to the purpose for which it is best suited is as necessary to the future well-being of the community as it is logical. Good agricultural land ought to be devoted to farming, and lands unsuited to the growth of field crops, or to cattle ranching, but well adapted to the production of trees, should be reserved as forests.

During the early days of settlement little information was available which would enable the prospective settler to decide what land would give him a living if developed for agriculture and what land was unsuitable. As a result, much land was homesteaded which should have been reserved from settlement and devoted to forest production or some other non-agricultural use. The same mistake was made whenever the prices of agricultural products were high, for instance, after the first world war. This error impaired the forests and caused great hardship to settlers; in many cases, resulting in a bankrupt farmer and a deserted farm. In other cases, lands were deliberately stripped of their timber by "bogus settlers"—men who took up land simply to get the timber on it, and who abandoned their holdings as soon as they had cut off the wood. These lands reverted to the Crown if the homestead duties had not been completed, and were often entered on the second or even third time. Where the homesteader had secured title the land often had to be taken over by the local municipality in lieu of unpaid taxes.

The municipalities in order to get the lands back on the tax rolls sold the land to other settlers at very nominal prices. The new settler, if he was lucky, might get one good crop, and he might cut remaining timber, but the land would eventually be abandoned to the municipality again. A number of municipalities in southeastern Manitoba, in the Interlake area, and in an area west of Lake Manitoba (West-lake) eventually were forced into receivership and their obligations had to be taken over by the provincial government. This change in administration did not solve the problem which had been brought about by unwise settlement policies in the first place; local schools, roads, and other necessary services still had to be maintained on an inadequate tax base. There appear to be two alternative remedies to the situation: first, to remove the surplus population to other districts where they can be gainfully employed; second, to build up the resources of the area to a point where the present population can secure a living by their own efforts. A committee appointed by the provincial government, after investigating a problem area in southeastern Manitoba, has recently made a report recommending a program of forestry development as the most important element in the solution of the local problem, and preliminary steps have already been undertaken towards implementing this recommendation.

Fortunately, even in the early days of settlement, some attention was given to land-use planning. The Turtle Mountain, Spruce Woods, and Riding Mountain areas were closed to settlement as early as 1895. Other reservations were made later by the Federal government, and since the transfer of the natural resources the province has established a number of forest reserves in areas unsuitable for agricultural development. The names and areas of the reserves in Manitoba are given on the following page:

Scientific land classification may be said to date from 1927 when the Manitoba Soil Survey, (a joint Federal-Provincial project), commenced a systematic soil survey of the province. The first surveys covered the older settled areas, but more recently the soil survey has been extended into the fringe areas of scattered settlement and beyond. The reports and soil maps of this survey are proving of utmost value in planning future expansion or retraction of settlement.

**Table C**  
*Areas of Forest Reserves in Manitoba*

FOREST RESERVE	AREA square miles
Turtle Mountain.....	109
Spruce Woods.....	222
Duck Mountain.....	1,426
Porcupine.....	787
Sandilands.....	570
Whiteshell.....	1,088
Cormorant.....	575
Agassiz.....	275
Belair.....	54
Northwest Angle.....	280
<b>TOTAL.....</b>	<b>5,386</b>

### ***Value of the Forests***

It is only recently that the importance of the forest resources of Manitoba as compared with her agricultural wealth has begun to be appreciated. It is true that in Manitoba the forests occupy a place of smaller relative importance than do the forests of eastern Canada or British Columbia. Nevertheless, the forests are of great value, and their influence is felt in many different ways.

After the better farming lands on the prairies and in the aspen grove belt were settled, development commenced further north. It was found that only limited areas of the forested lands of the north were suitable for settlement, and even in the south there were areas unsuitable for agriculture. It seems unlikely that the ultimate agricultural area will exceed 20 per cent of the 211,775 square miles, which is the total land area of the province.

The forest inventory shows that 61.1 per cent of the land area of the province is forested or classed as potentially productive forest land. Of this forest area, about one-half is covered by productive forest or is capable of production. The remaining half is classed as nonproductive forest which means that, although tree covered,—due to climatic conditions, lack of drainage or thinness of soil, it is not expected to produce a commercial wood crop, but should serve a useful purpose in protecting the soil and as a refuge for wild life.

Since 92 per cent of the productive forest area is provincial Crown land, the most obvious direct value to the government consists of the revenue obtained from the forest. Table D shows provincial

revenue from the forest, at five-year intervals from 1930-31 to 1955-56, and for the fiscal year 1959-60.

**Table D**  
*Revenues from Manitoba Forests*

Year Ending	
March 31, 1931.....	\$ 163,667
April 30, 1936.....	201,416
April 30, 1941.....	311,378
April 30, 1946.....	381,699
March 31, 1951.....	698,088
March 31, 1956.....	1,039,544
March 31, 1960.....	1,132,008

There are several stages in the calculation of the value of forest production, which may be listed as follows:

**Operations in the Woods**—This consists of the value of logs and bolts, etc., in the woods, on farms, or delivered to local mills or shipping points. Statistics covering these values are published annually by the Dominion Bureau of Statistics under the title "Operations in the Woods." Some of these raw materials from the forest, such as fuelwood bolts, fence posts, building logs, and piling, are used as they are or with slight modification. Other forest products such as sawlogs, pulpwood bolts, tie bolts, and hydro poles are taken to mills or treating plants, where they receive added value in manufacturing as outlined below.

**Value added by Primary Manufacturing**—When logs and bolts have been delivered to a sawmill, pulp and paper mill, or other plant, they receive further treatment, being made into lumber, pulp, paper, etc. This treatment may be considered as the first stage in manufacturing and the resulting product has received an added value—"value added by manufacturing." This added value is arrived at by deducting from the manufactured value, the cost of raw materials, chemicals, fuel and power used in the process. Raw material includes the cost of logs and bolts, the values of which have already been calculated under operations in the woods.

**Operations in the Woods plus Primary Manufacturing**—The provincial Forest Service when quoting figures for the value of forest production has always used the figures for operations in the woods plus the values added by manufacturing any logs and

bolts which were further processed within the province to produce lumber or pulp and paper. Table E presents these total values in Line 3 for the last five years for which statistics are available. It will be noted that these values are made up of the values of "Operations in the Woods," Line 1, and "Primary Manufacturing," Line 2.

**Table E**  
*Net Value of Forest Production—Manitoba  
by Years: 1953 to 1957  
(in Thousands of Dollars)*

Stage	Years				
	1953 \$,000	1954 \$,000	1955 \$,000	1956 \$,000	1957 \$,000
1. Operations in the woods	9,097	9,941	9,486	13,193	10,634
2. Primary manufacturing	10,155	10,825	12,013	10,756	11,095
3. SUBTOTAL.....	19,252	20,766	21,499	23,949	21,729
4. Wood-using industries.....	11,539	10,149	11,019	11,751	12,457
5. Paper-using industries.....	6,192	5,215	6,831	5,651	6,463
6. SUBTOTAL.....	17,731	15,364	17,850	17,402	18,920
7. Duplication.....	1,067	1,090	1,204	1,599	1,415
8. TOTAL.....	35,916	35,040	38,146	39,752	39,234

**Secondary Manufacturing**—After logs have been sawn into lumber, a portion of this lumber, as well as other imported lumber, is further manufactured by secondary wood-using industries. These industries include sash and door factories, planing mills, box factories, and plants producing a wide range of products, such as furniture, boats, sporting goods, cooperage, caskets, and miscellaneous articles. The plywood and excelsior industries are also classed as wood-using industries, although they use logs or bolts rather than lumber as their principal raw material.

Line 5 in Table E shows the net value of production of the paper-using industries. These are firms which use paper as their principal raw material, and which produce paper bags and boxes, envelopes and stationery, roofing paper, wallpaper, etc.

The total net value of forest production in Manitoba is shown in Line 8 of the table. This figure is arrived at by adding the net values of operations in the woods, primary and secondary manufacturing, and deducting from this total an amount shown in Line 7 covering certain duplications of value.

#### **Forest Utilization**

Statistics on the volume of forest production from provincial Crown lands have been compiled an-



*Survey camp on Manitoba's northern boundary—Latitude 60°—showing Transition forest.*

nually from 1930 to the present time. These figures are expressed in the units used in scaling: thousands of feet board measure for lumber; cords for pulpwood, fuelwood, etc.; lineal feet for round timber and piling; and as individual pieces for products such as railway ties, poles, fence posts, and Christmas trees. The average annual cut for the five-year period 1954-55 to 1958-59 is shown in Table F.

**Table F**  
*Utilization from Provincial Crown Lands  
by Forest Products—Average  
Annual Production for Five-Year Period  
1954-55 to 1958-59*

Product	Unit	Softwood	Hardwood	TOTAL
Lumber.....	M ft.b.m.	39,736	6,383	46,119
Pulpwood.....	Cords	236,886	3,702	240,588
Boxwood.....	Cords	1,923	968	2,891
Fuelwood.....	Cords	13,876	6,239	20,115
Plywood.....	Cords	.....	482	482
Railway ties.....	Pieces	118,890	.....	118,890
Line Poles.....	Pieces	28,371	.....	28,371
Fence Posts.....	Pieces	318,140	23,950	342,090
Christmas trees.....	Pieces	76,594	.....	76,594
Round timber.....	Lineal feet	705,600	14,400	720,000
Piling.....	Lineal feet	21,000	.....	21,000

For purposes of comparison, year by year, it is convenient to express the annual cut in a common unit of wood volume. Table G shows the cut of the various products from provincial Crown lands, converted to thousands of merchantable cubic feet, in five-year intervals from 1930-31 to 1950-51, and by years since that time.

**Table G**  
*Primary Forest Production  
From Provincial Crown Lands*

Fiscal Year	Cut in Thousands of Cubic Feet of Merchantable Timber				
	Green Wood			Dry Wood	TOTAL WOOD
	Softwood	Hardwood	Subtotal		
1930-31.....	*	*	*	*	18,199
1935-36.....	11,894	2,849	14,743	3,759	18,502
1940-41.....	16,338	3,985	20,323	3,349	23,672
1945-46.....	16,721	4,109	20,830	2,287	23,117
1950-51.....	29,719	3,250	32,969	2,629	35,598
1955-56.....	26,274	1,601	27,875	2,636	30,511
1956-57.....	33,950	3,307	37,257	5,987	43,244
1957-58.....	30,465	2,730	33,195	1,124	34,319
1958-59.....	19,481	2,040	21,521	1,536	23,057
1959-60.....	26,764	2,367	29,131	1,150	30,281

\*Details not available.

In addition to the cut on provincial Crown lands, wood is also utilized from private lands, Indian reserves, and Federal Crown lands. The Dominion Bureau of Statistics publish annually an estimate of the total wood cut in the province. In earlier years there was a very large cut of poplar fuelwood taken mainly from farm lands and used on the farm or sold locally in towns and villages. The amount of wood used as fuel has been greatly reduced in more recent years due to the competition of coal, oil, gas, and electricity, although the use of wood was stimulated for a time during the second world war.

A very large cut of pulpwood from private lands occurred in 1930, due to the fact that this wood could be exported to the United States at that time, while the export of pulpwood from Crown lands was prohibited. This embargo was suspended shortly afterwards, but in any case the cut of pulpwood from private lands has gradually lessened until it is now of minor importance.

### Fire Loss

Uncontrolled fire in the forest causes loss in three ways. First, by killing merchantable timber, although this timber may sometimes be salvaged by immediate cutting if the area is accessible, and if there is an available market. The loss of young growth is often of greater importance; for example, a stand of 50-year-old spruce, which should mature at 100 years, is set back by fire to zero age, even if regeneration takes place, and if regeneration does not take place the area is deleted from the total producing area. Fire may also do damage by burning off the humus cover which has accumulated during past years, hence depleting soil fertility; damage is most severe on areas of thin soil lying on rock where the very soil itself often is eroded after fire.

Controlled fire, on the other hand, is a useful silvicultural tool, and, under certain circumstances, may improve the seed bed and create favourable conditions for the regeneration of desirable species. In Manitoba, very little of this is done due to average low humidity and high winds.

The cause of forest fires in the years, 1955, 1956, 1957, 1958, and 1959, and the 10-year average for the period 1950 to 1959 is shown in the following statement:

**Table H**  
*Number of Fires by Causes*

Cause	Year					Average Annual 10-Year Period, 1950-59	
	1955	1956	1957	1958	1959	Num- ber	% by Area Burn
Camp fires.....	81	117	136	78	30	70	7.1
Smokers.....	46	26	28	61	19	34	1.7
Settlers.....	34	8	23	92	18	37	29.5
Railways.....	13	22	22	13	3	15	1.8
Industrial operations	5	2	14	4	3	7	0.4
Incendiary.....	15	6	5	31	4	13	4.2
Public works.....	3	4	5	15	9	4	0.1
Man caused.....	197	185	233	294	86	180	44.8
Lightning.....	114	137	83	40	48	61	35.3
Unclassified.....	9	17	17	34	15	19	17.2
Unknown.....	7	7	9	18	6	19	2.7
TOTAL—All Causes	327	346	342	386	155	260	100.0

The fires in the protected area for the 5-year period from 1955 to 1959 are tabulated below, with the average loss for the period.

**Table I**  
*Fire Losses 1955 to 1959*

Year	Area Burned in Acres		Volume Burned	
	Young Growth	Merchant- able	Saw Timber M ft.b.m.	Cords
1955.....	15,538	39,309	31	292,631
1956*.....	134,868	205,883	4,419	1,329,278
1957.....	24,260	37,951	186	202,073
1958.....	151,332	170,661	979	347,222
1959.....	4,341	14,010	20	62,730
TOTAL—for 5-Year Period....	330,359	467,814	5,635	2,233,934
Average Per Year..	66,072	93,563	1,127	446,787
Equivalent in Merchantable Cu. Ft. per year.		225,400		37,976,895

\*79.5 per cent of the fire loss in 1956 occurred in the Inaccessible Forest Area.

#### **Depletion by Insects and Disease**

In considering the loss of wood volume due to insects and disease it is advisable to separate epidemic and endemic conditions. The last mentioned activities of insects and fungi are part of the normal life of the forest, and are constantly going on, nor are their activities all to be considered harmful in the long run. As forests become older the number of trees per acre has to be reduced. The death of

the weaker trees is hastened by those insects which attack only trees of reduced vigour, and their decay is furthered by the action of fungi. In the same way, these agencies hasten the disappearance of trees which have become overmature, and make the room which they occupied available for younger and more rapid growth.

Epidemic outbreaks of insect and fungus pests may, on the other hand, do great damage. The larch sawfly epidemic which swept Manitoba in the early years of the present century, has, up to date, been the worst known. Most of the tamarack in the province was killed by repeated defoliation, and as the insect concerned is still present the future of the young tamarack stands which sprang up after the parent trees were killed is somewhat uncertain.

Jack pine budworm has been epidemic in various parts of Manitoba since it was first noticed in the Sandilands Forest Reserve in the 1930s, but in this case only a small percentage of the trees have been killed although damage to the tops and consequent loss of height growth has been noticeable.

Spruce budworm was first noted in Manitoba in 1951, being found near Namew Lake on the Saskatchewan boundary. Since that time outbreaks of epidemic proportion have been noted at a num-



*Forest Ranger station.*

ber of locations around Lake Winnipeg and elsewhere. This insect has killed a considerable percentage of the balsam fir trees occurring in a number of local areas, and a lesser percentage of white spruce.

A survey of forest insects and disease is conducted annually by the Forest Biology Division of the Federal Department of Agriculture. Research work is carried on by the same organization with the object of determining the best methods of control of these pests.

### **Growth and Depletion**

The recently completed forest inventory has supplied information on the extent of land which is under productive forest or which is likely to become productive as the result of natural seeding, or by artificial methods. The productive area has been further divided into merchantable and young growth areas, and each of these has been subdivided by age classes and cover types.

The merchantable wood volume of all merchantable stands has been obtained and the information has been tabulated by species, size class, age, and cover type.

With this information available, it is possible to calculate the annual volume increment. In dealing with the whole accessible forest area, with its wide distribution of age classes, the permissible depletion may be considered as equal to the increment, although this might not be true in the case of smaller forest areas.

The relation of supply to demand in the case of the softwoods (conifers) differs radically from that of the hardwood (broad-leaved trees). The situation of the two groups will, therefore, be summarized separately.

Table J summarizes the position of Manitoba's accessible softwood forest with regard to volume, increment, and depletion. The annual increment, or permissible depletion, has been based on an average rotation of 100 years for all the softwood species; jack pine and balsam fir are normally cut at an earlier age than 100 years, but spruce in some sites will require a longer period.

The figure for utilization is the average cut of green softwood on provincial Crown lands for the 10-year period 1949-50 to 1958-59. The waste from fire figure is the average of salvable and unsalvable

**Table J**  
*Present Volume of Softwood and Rate of Depletion  
on Accessible Provincial Crown Lands*

	Merchantable Volume millions of cubic feet
Volume of merchantable timber.....	5,576.6
Permissible rate of depletion.....	111.5
Actual rate of depletion	
Utilization.....	28.8
Waste from fire.....	12.3
Waste from insects and disease.....	1.7
Total Waste.....	42.8
Total Depletion.....	68.7
Under-cut.....	

wood burned as taken from Forest Service records for the 30-year period 1930 to 1959. The figure for waste from insects and disease is based on a percentage figure submitted in a report to the Gordon Commission on Forestry in 1956.

Table J indicates that for the accessible forest area of Manitoba, as a whole, the softwood forest is not being depleted faster than it can grow; on the contrary, the figures show that the annual cut could safely be more than trebled. With improved fire protection and silviculture, the annual cut could be still further increased.

When consideration is given to the growth and depletion by districts, it becomes apparent that the situation re balance of growth and depletion differs widely as between the more accessible and the less accessible districts. The danger is that the area closest to markets may be cut or burned over faster than growth can restore the balance. In these areas it is necessary to restrict the annual cut. See section on Forest Regulation.

In the less accessible areas the situation is the reverse of that described above; here, the annual growth much exceeds the depletion from cutting, fire, insects, and disease; consequently, the stands as they become overmature will sooner or later succumb to decay or windfall. Fortunately, the age class distribution in most of the less accessible area is favourable in the sense that a large proportion of the stands are in the middle age classes, hence, the timber is just coming into merchantable size, and is not likely to deteriorate in the near future. What is needed here, to get full utilization of the forest growth, is new forest industries located in these northern areas, preferably, industries pro-

ducing pulp and paper, which could by concentrating the raw wood, and hence reducing the weight, compensate the costs of shipping the product to market.

In the case of hardwoods—poplar, birch, etc., calculations of growth and records of depletion show that growth exceeds depletion about ten times. The problem here is to find new markets, especially for the smaller sizes; in the more accessible areas there is a fair market for poplar and birch of sawlog size. In view of the fact that aspen poplar, the main hardwood species, is already the leading pulpwood species used in the mills of the adjoining Lake States of the U.S.A., it seems likely that Canadian forest industry may before long establish plants in this country which can use our surplus of poplar.

It would appear that private hardwood forest is being depleted at a faster rate than it is growing, or in other words, the wood capital is being depleted. This is to be expected in areas where the land is being opened for settlement, and is indeed necessary and desirable, provided that the land is being put to a more profitable use. There are portions of many farms, however, which are probably better suited for forestry than for agriculture. Consequently, and in view of expected new markets

for poplar, as well as for other tree species, farmers should give the matter careful thought before clearing these areas.

### **Forest Regulation**

Forests are a crop, and when trees reach maturity they should be cut and utilized rather than be allowed to deteriorate through rot and eventually become an economic loss. It is equally important that immature timber is not cut, except under exceptional circumstances, such as the improvement of the stand.

One of the forester's main aims is to so regulate the forest that approximately equal quantities of wood can be removed annually. In a well regulated, or normal, forest the annual growth will equal the depletion by cutting, fire, etc. If the age class distribution is not normal, as, for instance, where certain age classes are in excess of the average, it may be necessary to temporarily decrease or increase the cut which is taken from the older age classes, in order to gradually bring about the normal age class distribution. Where the age classes are evenly distributed, and provided regeneration takes place on the cut-over areas, the volume cut or otherwise depleted annually, should equal the annual increment.

A well regulated forest ensures the stability and permanence of the local forest industries which depend on the forest for their raw material. These forest industries give part time or whole time employment to the local population, so that forest regulation affects the whole economy of the district.

The accessible forest area of Manitoba has been divided, for inventory and management purposes, into about 40 Working Circles or Management Units. These Management Units are gradually being brought under sustained yield management, or regulation of the cut, so that yields of timber products will be permanently available. In making these management plans, the more accessible areas and the timber species most in demand have been dealt with first as these areas and species have been most in danger of overcutting. Overcutting, of course, reduces wood capital and, consequently, reduces the annual increment from that capital.

About three-quarters of the more accessible area now has a regulated cut, at least of those species which are most in demand, and which, therefore, are most likely to be overcut when the cut is not



*Nursery planting stock loaded for shipment to numerous southern Manitoba destinations.*

regulated. As more intensive surveys, (management surveys), are completed; revised, and more detailed working plans will be brought into use.

### **Reforestation**

Forest crops, unlike farm crops which are harvested yearly, have a rotation period from seed-time to harvest of from 40 to 120 years or sometimes longer. In forestry, as in agriculture, crop must succeed crop, if forestry or agriculture is to continue.

The new crop of trees which is to replace the one removed by cutting or killed by fire, etc., may come naturally, from seed sown by the preceding generation; it may come from sprouts which spring up from the old roots; or it may come artificially by planting or by the broadcasting of seed.

The regeneration of hardwood forest offers little difficulty; the trees when cut down or burned usually sprout readily, either from the stump, or in the case of aspen poplar, by sending up shoots from the horizontal roots. Regeneration of hardwood also takes place from seed. Poplar and birch produce seed in abundance and this seed, especially that of the poplar, is carried great distances by the wind, where it may produce a new crop, provided the seed-bed conditions are favourable.

Generally speaking, the softwood species reproduce themselves from seed, and not vegetatively as the hardwoods do. There is a fairly important exception to this rule in the case of black spruce; this species, when growing in moist sites, where sphagnum moss is present, quite commonly reproduce from "layering"—lower branches become covered with moss, take root and send up new tree trunks. The same thing happens although less commonly in the case of balsam fir.

In Manitoba, white spruce and jack pine are sometimes difficult to regenerate, also black spruce when growing on upland sites. It has been proved by experiments in the forest that "scalping" or removal of the litter and humus layers, thus exposing the mineral soil, will greatly assist nature in the regeneration of these species.

When dealing with such vast areas of forest as occur in Manitoba, it is necessary to depend mainly on natural regeneration for the initiation of new forest crops. This is especially true in the less accessible forests. Fortunately the more northern forests, which have a high percentage of spruce,

appear to regenerate to that species more readily than is the case further south where the proportion of poplar is higher.

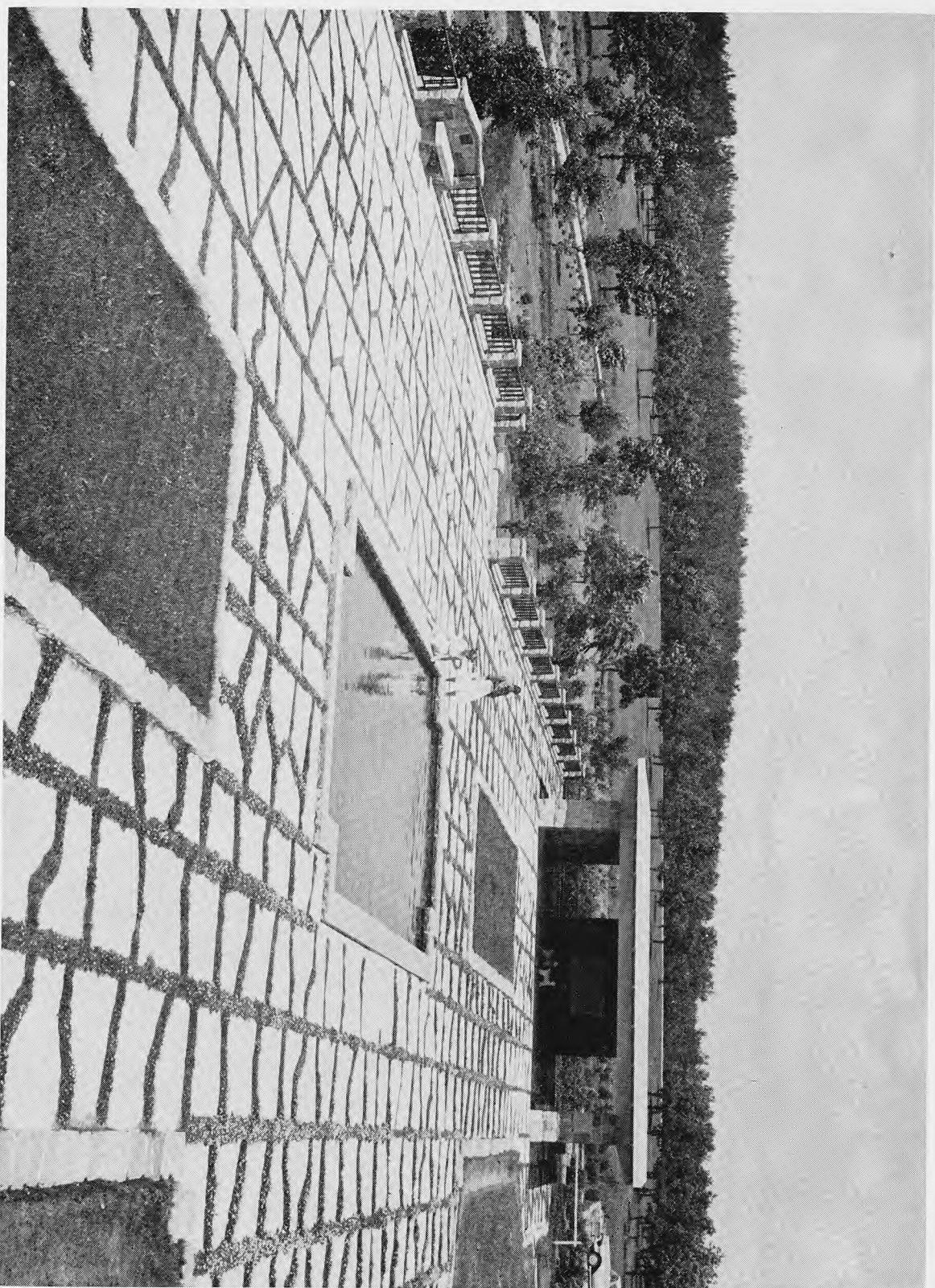
Artificial regeneration by planting or seeding is expensive and can only be justified in more accessible areas where fire protection is adequate and where a market for the product is reasonably certain. There are such areas in southern Manitoba where both young growth and older trees have been destroyed by clearing for settlement or for timber, by fire, or more commonly by logging followed by fire; in these areas all seed sources have been eliminated, and artificial methods must be resorted to if the forest is to be restored.

Experiments with artificial seeding are being carried on in southeastern Manitoba in the hope that this method may prove to be cheaper than that of planting.

Planting has certain advantages over other methods of regeneration: in planting the forester has full control over species composition and spacing. In broadcast seeding the number of seedlings which become established per acre is very uncertain; if too few, then further seeding or planting will be required, if too many, then expensive thinning may be necessary. With natural regeneration control is even less complete as a mixture of species may come in, some of which are inferior or undesirable.

The first experimental plantation was set out in the Spruce Woods forest reserve in 1905. Planting started in the Turtle Mountain in 1912, while the initial year for the Duck Mountain was 1920, and for Sandilands 1926. In later years a limited amount of planting has been done on the Porcupine, Agassiz, and Whiteshell forest reserves.

A considerable expansion in the planting program took place following the signing of an agreement between the Federal and Provincial authorities in 1951. Under this agreement Canada gives financial assistance in planting, seeding, and the establishment of planting stock. Since that time the Pineland Forest Nursery Station has been established at a point, east of Winnipeg, where the Trans-Canada Highway crosses the Whitemouth River, and the annual planting program has been much expanded. The total number of trees planted to date amounts to 15,823,000 of which 7,337,000 have been planted under the Canada Forestry Act Agreement.



*The Peace Panel, International Peace Garden, Turtle Mountain Forest Reserve.*

—Dept. of Industry and Commerce

# Appendix

**Table 1**  
*Summary of Land and Water Area  
 Province of Manitoba*

Description	Land Area			Water acres	TOTAL AREA acres
	Cruised acres	Uncruised acres	TOTAL LAND acres		
<b>A. ACCESSIBLE</b>					
<b>1. FOREST ZONE</b>					
Provincial Crown.....	33,980,700	.....	33,980,700	4,837,883	38,818,588
Patented.....	1,261,930	.....	1,261,930	3,326	1,265,256
SUBTOTAL.....	35,242,630	.....	35,242,630	4,841,214	40,083,844
Federal Crown.....	737,636	.....	737,636	27,622	765,258
Indian Reserves.....	.....	280,701	280,701	.....	280,701
<b>TOTAL FOREST ZONE</b> .....	<b>35,980,266</b>	<b>280,701</b>	<b>36,260,967</b>	<b>4,868,836</b>	<b>41,129,803</b>
PER CENT.....	.....	.....	88.2	11.8	100.0
<b>2. AGRICULTURAL ZONE</b>					
Provincial Crown.....	.....	2,367,906	2,367,906	372,360	2,740,236
Patented.....	.....	18,547,163	18,547,163	19,650	18,566,813
Indian Reserves.....	.....	158,739	158,739	.....	158,739
<b>TOTAL AGRICULTURAL ZONE</b> .....	.....	<b>21,073,808</b>	<b>21,073,808</b>	<b>392,010</b>	<b>21,465,818</b>
PER CENT.....	.....	.....	98.2	1.8	100.0
<b>3. MAJOR LAKES†</b>					
Crown.....	.....	.....	.....	8,405,000	8,405,000
<b>TOTAL ACCESSIBLE</b> .....	<b>35,980,266</b>	<b>21,354,509</b>	<b>57,334,775</b>	<b>13,665,846</b>	<b>71,000,621</b>
PER CENT.....	.....	.....	80.8	19.2	100.0
<b>B. INACCESSIBLE</b>					
<b>4. FOREST ZONE</b>					
Provincial Crown.....	26,705,713	.....	26,705,713	4,637,117	31,342,830
Indian Reserves.....	.....	91,014	91,014	.....	91,014
<b>TOTAL FOREST ZONE</b> .....	<b>26,705,713</b>	<b>91,014</b>	<b>26,796,727</b>	<b>4,637,117</b>	<b>31,433,844</b>
PER CENT.....	.....	.....	85.2	14.8	100.0
<b>5. TRANSITION AND TUNDRA ZONES</b>					
Provincial Crown.....	.....	51,393,787	51,393,787	6,801,037	58,194,824
Indian Reserves.....	.....	10,711	10,711	.....	10,711
<b>TOTAL TRANSITION AND TUNDRA ZONES</b> .....	.....	<b>51,404,498</b>	<b>51,404,498</b>	<b>6,801,037</b>	<b>58,205,535</b>
PER CENT.....	.....	.....	88.3	11.7	100.0
<b>TOTAL INACCESSIBLE</b> .....	<b>26,705,713</b>	<b>51,495,512</b>	<b>78,201,225</b>	<b>11,438,154</b>	<b>89,639,379</b>
PER CENT.....	.....	.....	87.2	12.8	100.0
<b>GRAND TOTAL</b> .....	<b>62,685,979</b>	<b>72,850,021</b>	<b>135,536,000</b>	<b>25,104,000</b>	<b>160,640,000</b>
PER CENT.....	.....	.....	84.4	15.6	100.0

†Lakes Winnipeg, Manitoba and Winnipegosis only.

**Table 2**  
*Land Classification of Cruised Areas in Acres*

Forest Section	*Productive Forest			†Potentially Productive Forest	‡Non-Productive Forest	#Permanently Nonforested Land	TOTAL LAND
	Unmerchantable	Merchantable	SUBTOTAL				
ACCESIBLE FOREST							
PROVINCIAL CROWN							
Southeastern.....	155,187	648,936	804,123	116,225	294,145	251,097	1,465,590
Winnipeg River.....	195,871	1,125,849	1,321,720	344,502	518,327	393,804	2,578,353
Lowlands South.....	2,065,916	1,891,873	3,957,789	576,975	1,102,178	2,040,346	7,677,288
Mountain.....	8,118	1,084,047	1,092,165	85,072	154,662	61,363	1,393,262
Lowlands North.....	1,283,305	969,758	2,253,063	64,787	1,265,601	1,856,439	5,439,890
Nelson River.....	1,832,140	2,525,566	4,357,706	18,474	3,503,665	1,826,681	9,706,526
Northern Mining.....	2,631,897	1,831,514	4,463,411	36,510	853,186	186,105	5,539,212
Southwestern.....	27,401	119,861	147,262	8,241	4,659	20,417	180,579
TOTAL PROVINCIAL CROWN.....	8,199,835	10,197,404	18,397,239	1,250,786	7,696,423	6,636,252	33,980,700
FEDERAL CROWN							
Riding Mountain National Park.....	126,241	452,529	578,770	100,288	14,771	43,807	737,636
TOTAL FEDERAL CROWN.....	126,241	452,529	578,770	100,288	14,771	43,807	737,636
PATENTED LAND							
Southeastern.....	41,813	61,535	103,348	63,656	27,011	61,957	255,972
Winnipeg River.....	7,215	4,873	12,088	4,372	1,363	7,815	25,638
Lowlands South.....	245,258	130,181	375,439	150,801	21,718	402,511	950,469
Lowlands North.....	3,260	6,967	10,227	1,445	2,871	15,308	29,851
TOTAL PATENTED LAND.....	297,546	203,556	501,102	220,274	52,963	487,591	1,261,930
TOTAL ACCESSIBLE.....	8,623,622	10,853,489	19,477,111	1,571,348	7,764,157	7,167,650	35,980,266
PERCENTAGE.....	24.0	30.1	54.1	4.4	21.6	19.9	100.0
INACCESSIBLE FOREST							
PROVINCIAL CROWN							
Eastern.....	4,709,407	2,711,315	7,420,722	115,932	7,498,536	1,348,456	16,383,646
Northern.....	5,393,610	849,347	6,242,957	20,512	3,750,318	308,280	10,322,067
TOTAL PROVINCIAL CROWN.....	10,103,017	3,560,662	13,663,679	136,444	11,248,854	1,656,736	26,705,713
TOTAL INACCESSIBLE.....	10,103,017	3,560,662	13,663,679	136,444	11,248,854	1,656,736	26,705,713
PERCENTAGE.....	37.9	13.3	51.2	0.5	42.1	6.2	100.0
WHOLE CRUISED AREA							
GRAND TOTAL.....	18,726,639	14,414,151	33,140,790	1,707,792	19,013,011	8,824,386	62,685,979
PERCENTAGE.....	29.9	23.0	52.9	2.7	30.3	14.1	100.0

\*Land supporting merchantable timber or young growth which will produce merchantable timber within a reasonable time.

†Cut-over, burn, brush or grassland, not now supporting productive forest, but capable of doing so.

‡Land with a forest cover such as treed muskeg, treed rock, and willow or alder swamp, but incapable of producing a forest crop of merchantable size within a reasonable time.

#Includes marsh, muskeg, rock, meadow, developed agricultural land, urban areas, roads and railroads. In general, lands not expected to produce a forest of any kind.

**Table 3**  
*Area Classification of Productive Forest by Cover Types and Merchantability  
 Cruised Area*

Forest Sections	COVER TYPES—AREA IN ACRES							
	Softwood		Mixedwood		Hardwood		TOTAL	
	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.
ACCESIBLE FOREST								
PROVINCIAL CROWN								
Southeastern.....	129,709	441,352	7,806	78,977	17,672	128,607	155,187	648,936
Winnipeg River.....	155,607	687,724	27,261	282,975	13,003	155,150	195,871	1,125,849
Lowlands South.....	1,059,557	1,027,870	562,052	561,338	444,307	302,665	2,065,916	1,891,873
Mountain (Duck and Porcupine).....	5,948	343,973	2,000	366,636	170	373,438	8,118	1,084,047
Lowlands North.....	848,029	692,708	400,347	245,697	34,929	31,353	1,283,305	969,758
Nelson River.....	1,240,647	1,712,247	472,489	701,339	119,004	111,980	1,832,140	2,525,566
Northern Mining.....	1,952,244	1,464,049	671,658	322,687	7,995	44,778	2,631,897	1,831,514
Southwestern.....	13,334	18,086	11,928	35,786	2,139	65,989	27,401	119,861
<b>SUBTOTAL.....</b>	<b>5,405,075</b>	<b>6,388,009</b>	<b>2,155,541</b>	<b>2,595,435</b>	<b>639,219</b>	<b>1,213,960</b>	<b>8,199,835</b>	<b>10,197,404</b>
TOTAL PROVINCIAL CROWN.....		11,793,084		4,750,976		1,853,179		18,397,239
FEDERAL CROWN								
Riding Mountain National Park.....	11,846	32,468	16,619	86,724	97,776	333,337	126,241	452,529
<b>SUBTOTAL.....</b>	<b>11,846</b>	<b>32,468</b>	<b>16,619</b>	<b>86,724</b>	<b>97,776</b>	<b>333,337</b>	<b>126,241</b>	<b>452,529</b>
TOTAL FEDERAL CROWN		44,314		103,343		431,113		578,770
PATENTED LANDS								
All Forest Sections.....	70,716	41,128	74,453	60,495	152,377	101,933	297,546	203,556
<b>SUBTOTAL.....</b>	<b>70,716</b>	<b>41,128</b>	<b>74,453</b>	<b>60,495</b>	<b>152,377</b>	<b>101,933</b>	<b>297,546</b>	<b>203,556</b>
TOTAL PATENTED LAND		111,844		134,948		254,310		501,102
<b>TOTAL ACCESSIBLE.....</b>		<b>11,949,242</b>		<b>4,989,267</b>		<b>2,538,602</b>		<b>19,477,111</b>
INACCESSIBLE FOREST								
PROVINCIAL CROWN								
Eastern Division.....	3,728,715	2,145,340	730,718	463,617	249,974	102,358	4,709,407	2,711,315
Northern Division.....	3,477,349	665,338	803,122	148,611	1,113,139	35,398	5,393,610	849,347
<b>SUBTOTAL.....</b>	<b>7,206,064</b>	<b>2,810,678</b>	<b>1,533,840</b>	<b>612,228</b>	<b>1,363,113</b>	<b>137,756</b>	<b>10,103,017</b>	<b>3,560,662</b>
TOTAL PROVINCIAL CROWN.....		10,016,742		2,146,068		1,500,869		13,663,679
<b>TOTAL INACCESSIBLE</b>		<b>10,016,742</b>		<b>2,146,068</b>		<b>1,500,869</b>		<b>13,663,679</b>
WHOLE CRUISED AREA								
SUBTOTAL.....	12,693,701	9,272,283	3,780,453	3,354,882	2,252,485	1,786,986	18,726,639	14,414,151
GRAND TOTAL.....		21,965,984		7,135,335		4,039,471		33,140,790
PERCENTAGE.....		66.3		21.5		12.2		100.0

Table 4

*Summary of Merchantable Volume by Cover Types—Cruised Area*

Forest Sections	*VOLUME IN C UNITS (100 Cubic Feet Units) BY COVER TYPES			
	Softwood	Mixedwood	Hardwood	TOTAL
ACCESIBLE FOREST				
PROVINCIAL CROWN				
Southeastern.....	2,805,782	695,319	1,086,103	4,587,204
Winnipeg River.....	5,645,981	2,508,453	1,320,483	9,474,917
Lowlands South.....	4,715,396	3,460,328	1,123,349	9,299,073
Mountain (Duck and Porcupine).....	4,104,161	4,768,770	3,821,956	12,694,887
Lowlands North.....	5,091,340	2,200,658	170,992	7,462,990
Nelson River.....	10,769,502	4,749,721	571,959	16,091,182
Northern Mining.....	10,026,295	2,210,811	264,125	12,501,231
Southwestern.....		68,786	198,969	267,755
TOTAL PROVINCIAL CROWN.....	43,158,457	20,662,846	8,557,936	72,379,239
FEDERAL CROWN				
Riding Mountain National Park.....	334,692	1,032,575	4,222,153	5,589,420
TOTAL FEDERAL CROWN.....	334,692	1,032,575	4,222,153	5,589,420
PATENTED LANDS				
All Forest Sections.....	196,692	201,467	376,325	774,484
TOTAL PATENDED LANDS.....	196,692	201,467	376,325	774,484
TOTAL ACCESSIBLE LANDS.....	43,689,841	21,896,888	13,156,414	78,743,143
INACCESSIBLE FOREST				
PROVINCIAL CROWN				
Eastern Division.....	28,040,529	6,090,897	1,141,771	35,273,197
Northern Division.....	8,680,266	1,772,507	824,006	11,276,779
TOTAL PROVINCIAL CROWN.....	36,720,795	7,863,404	1,965,777	46,549,976
TOTAL INACCESSIBLE AREA.....	36,720,795	7,863,404	1,965,777	46,549,976
WHOLE CRUISED AREA				
GRAND TOTAL.....	80,410,636	29,760,292	15,122,191	125,293,119
PER CENT.....	64.2	23.7	12.1	100.0

\*Net roundwood volume: Stump height 1', top diameter 3"; one stacked cord equals approximately 85 cu. ft. of wood.

Table 5

## Softwood and Hardwood Volume by Size Classes—Cruised Area

Forest Section	VOLUME IN CUNITS (100 Cubic Foot Units)								
	Softwood			Hardwood			TOTAL		
	4" - 9" D.B.H.*	10" + D.B.H.*	TOTAL	4" - 9" D.B.H.*	10" + D.B.H.*	TOTAL	4" - 9" D.B.H.*	10" + D.B.H.*	TOTAL

## ACCESIBLE FOREST

PROVINCIAL CROWN									
Southeastern.....	3,039,929	227,978	3,267,898	693,271	626,035	1,319,306	3,733,191	854,013	4,587,204
Winnipeg River.....	5,415,052	1,748,753	7,163,805	1,359,906	951,206	2,311,112	6,774,958	2,699,959	9,474,917
Lowlands South.....	6,066,249	1,159,689	7,225,938	1,431,608	641,527	2,073,135	7,497,857	1,801,216	9,299,073
Mountain (Duck and Porcupine).....	4,817,070	1,963,496	6,780,566	4,067,722	1,846,599	5,914,321	8,884,792	3,810,095	12,694,887
Lowlands North.....	5,129,195	1,229,353	6,358,548	940,302	164,140	1,104,442	6,069,497	1,393,493	7,462,990
Nelson River.....	11,761,050	1,813,924	13,574,974	9,107,647	408,561	9,516,208	13,868,697	2,922,485	16,091,182
Northern Mining.....	10,060,160	987,958	11,048,118	1,267,882	185,231	1,453,113	11,328,042	1,173,189	12,501,231
Southwestern.....	19,633	21,706	41,339	181,943	44,473	226,416	201,576	66,179	267,755
TOTAL PROVINCIAL CROWN.....	43,308,329	9,152,857	55,461,186	12,050,281	4,867,772	16,918,053	58,358,610	14,020,629	72,379,239
FEDERAL CROWN									
Riding Mountain National Park.....	191,690	697,250	888,940	1,136,490	3,563,990	4,700,480	1,328,180	4,261,240	5,589,420
TOTAL FEDERAL CROWN.....	191,690	697,250	888,940	1,136,490	3,563,990	4,700,480	1,328,180	4,261,240	5,589,420
PATENTED LAND									
All Forest Sections.....	310,071	58,073	368,144	272,533	133,807	406,340	582,604	191,880	774,484
TOTAL PATENTED LANDS.....	310,071	58,073	368,144	272,533	133,807	406,340	582,604	191,880	774,484
TOTAL ACCESSIBLE	46,810,090	9,908,180	56,718,270	13,459,304	8,565,569	22,024,873	60,269,394	18,473,749	78,743,143

## INACCESSIBLE FOREST

PROVINCIAL CROWN									
Eastern Division.....	24,317,380	6,558,606	30,875,986	3,674,159	723,052	4,397,211	27,991,539	7,281,658	35,273,197
Northern Division.....	7,740,160	2,099,076	9,839,236	1,214,707	222,836	1,437,543	8,954,867	2,321,912	11,276,779
TOTAL PROVINCIAL CROWN.....	32,057,540	8,657,682	40,715,222	4,888,866	945,888	5,834,754	36,946,406	9,603,570	46,549,976
TOTAL INACCESSIBLE	32,057,540	8,657,682	40,715,222	4,888,866	945,888	5,834,754	36,946,406	9,603,570	46,549,976

## WHOLE CRUISED AREA

GRAND TOTAL.....	78,867,630	18,565,862	97,433,492	18,348,170	9,511,457	27,859,627	97,215,800	28,077,319	125,293,119
PER CENT.....	80.9	19.1	100.0	65.9	34.1	100.0	77.6	22.4	100.0

\*D.B.H. is an abbreviation for diameter at breast height; trees are measured outside the bark 4½ feet above the ground.

**Table 6**

## Volume by Species—Cubic Measure—Cruised Area

Species	VOLUME IN C UNITS (100 Cubic Feet to 1 Cunit)					
	Accessible Forest			Inaccessible Forest	TOTAL MANITOBA	PER CENT
	Provincial Crown	Federal Crown	Patented	Provincial Crown		
White spruce.....	10,770,259	618,704	89,376	6,075,782	17,554,121	14.0
Black spruce.....	26,203,772	154,676	147,021	27,678,090	54,183,469	43.2
Balsam fir.....	3,138,121	53,330	65,111	1,550,665	4,807,927	3.9
Jack pine.....	14,592,411	62,230	49,207	5,410,775	20,114,623	16.1
Tamarack.....	655,022	.....	15,927	.....	670,949	0.5
Cedar.....	101,601	.....	1,502	.....	103,103	0.1
<b>TOTAL SOFTWOOD.....</b>	<b>55,461,186</b>	<b>888,940</b>	<b>368,144</b>	<b>40,715,222</b>	<b>97,433,492</b>	<b>77.8</b>
Aspen poplar.....	11,050,304	3,948,402	245,262	3,823,564	19,070,532	15.2
Balsam poplar.....	3,562,801	564,058	136,688	373,012	4,636,559	3.7
White birch.....	2,269,673	188,020	24,390	1,635,178	4,117,261	3.3
Others.....	35,275	.....	.....	.....	35,275	.....
<b>Total Hardwood.....</b>	<b>16,918,053</b>	<b>4,700,480</b>	<b>406,340</b>	<b>5,834,754</b>	<b>27,859,627</b>	<b>22.2</b>
<b>TOTAL ALL SPECIES.....</b>	<b>72,379,239</b>	<b>5,589,420</b>	<b>774,484</b>	<b>46,549,976</b>	<b>125,293,119</b>	<b>.....</b>
<b>PER CENT.....</b>	<b>57.8</b>	<b>4.5</b>	<b>0.6</b>	<b>37.1</b>	<b>.....</b>	<b>100.0</b>

**Table 7**

## Cubic Foot Volume Per Acre by Cover Types—Cruised Area

Cover Type	VOLUME IN CUBIC FEET PER ACRE											
	Softwood			Mixedwood			Hardwood			All Cover Types		
	Softwood	Hardwood	TOTAL	Softwood	Hardwood	TOTAL	Softwood	Hardwood	TOTAL	Softwood	Hardwood	TOTAL
Merchantable.....	788	79	867	606	281	887	223	623	846	676	193	869
Productive Forest.....	332	34	366	236	131	417	97	277	374	294	84	378

**Table 8**

## Saw-Timber Volume by Species—Cruised Area

Species	*VOLUME IN THOUSANDS OF BOARD FEET					
	Accessible Forest			Inaccessible Forest	TOTAL MANITOBA	PER CENT
	Provincial Crown	Federal Crown	Patented	Provincial Crown		
White spruce.....	2,452,275	263,926	14,453	1,687,750	4,418,404	34.7
Black spruce.....	706,462	7,886	4,713	1,624,686	2,343,747	18.4
Balsam fir.....	212,603	16,404	2,618	118,734	350,359	2.8
Jack pine.....	1,005,628	21,965	3,930	464,787	1,496,310	11.8
Tamarack.....	7,780	.....	262	.....	8,042	0.1
Cedar.....	9,954	.....	157	.....	10,111	
<b>TOTAL SOFTWOOD.....</b>	<b>4,394,702</b>	<b>310,181</b>	<b>26,133</b>	<b>3,895,957</b>	<b>8,625,973</b>	<b>67.8</b>
Aspen poplar.....	1,488,756	1,173,999	38,353	280,508	2,981,616	23.4
Balsam poplar.....	478,812	167,714	5,867	27,743	680,136	5.3
White birch.....	250,055	55,905	15,994	117,398	439,352	3.5
Others.....	3,313	.....	.....	.....	3,313	.....
<b>TOTAL HARDWOOD.....</b>	<b>2,220,936</b>	<b>1,397,618</b>	<b>60,214</b>	<b>425,649</b>	<b>4,104,417</b>	<b>32.2</b>
<b>TOTAL ALL SPECIES.....</b>	<b>6,615,638</b>	<b>1,707,799</b>	<b>86,347</b>	<b>4,321,606</b>	<b>12,731,390</b>	<b>100.0</b>
<b>PER CENT.....</b>	<b>52.0</b>	<b>13.4</b>	<b>0.7</b>	<b>33.9</b>	<b>100.0</b>	

\*Trees 10 inches and over in diameter at breast height converted to board measure.

Table 9

*Land Classification—Province of Manitoba*

Subdivision	LAND CLASSES IN ACRES						
	Productive Forest			Potentially Productive Forest	Nonproductive Forest	Permanently Nonforested Land	TOTAL LAND
	Unmerchantable	Merchantable	Subtotal				
ACCESIBLE AREA							
Provincial Crown Cruised.....	8,199,835	10,197,404	18,397,239	1,250,786	7,696,423	6,636,252	33,980,700
Federal Crown Cruised.....	126,241	452,529	578,770	100,288	14,771	43,807	737,636
Patented Cruised.....	297,546	203,556	501,102	220,274	52,963	487,591	1,261,930
SUBTOTAL CRUISED.....	8,623,622	10,853,489	19,477,111	1,571,348	7,764,157	7,167,650	35,980,266
Provincial Crown Uncruised.....	487,204	177,856	665,060	1,217,178	230,498	255,170	2,367,906
Indian Reserves Uncruised.....	85,719	82,087	167,806	43,011	63,452	165,171	439,440
Patented Uncruised.....	1,134,540	465,169	1,599,709	2,908,830	.....	14,038,624	18,547,163
SUBTOTAL UNCRUISED.....	1,707,463	725,112	2,432,575	4,169,019	293,950	14,458,965	21,354,509
TOTAL ACCESSIBLE.....	10,331,085	11,578,601	21,909,686	5,740,367	8,058,107	21,626,615	57,334,775
INACCESSIBLE AREA							
Provincial Crown Cruised.....	10,103,017	3,560,662	13,663,679	136,444	11,248,854	1,656,736	26,705,713
SUBTOTAL CRUISED.....	10,103,017	3,560,662	13,663,679	136,444	11,248,854	1,656,736	26,705,713
Provincial Crown Uncruised.....	.....	.....	.....	.....	22,003,426	29,390,361	51,393,787
Indian Reserves Uncruised.....	34,433	12,073	46,506	408	43,718	11,093	101,725
SUBTOTAL UNCRUISED.....	34,433	12,073	46,506	408	22,047,144	29,401,454	51,495,512
TOTAL INACCESSIBLE.....	10,137,450	3,572,735	13,710,185	136,852	33,295,998	31,058,190	78,201,225
PROVINCE OF MANITOBA							
Cruised.....	18,726,639	14,414,151	33,140,790	1,707,792	19,013,011	8,824,386	62,685,979
Uncruised.....	1,741,896	737,185	2,479,081	4,169,427	22,341,094	43,860,419	72,850,021
GRAND TOTAL.....	20,468,535	15,151,336	35,619,871	5,877,219	41,354,105	52,684,805	135,536,000
Crown Lands.....	18,916,297	14,388,451	33,304,748	2,704,696	41,193,972	37,982,326	115,185,742
Indian Reserves.....	120,152	94,160	214,312	43,419	107,170	176,264	541,165
Patented.....	1,432,086	668,725	2,100,811	3,129,104	52,963	14,526,215	19,809,093
GRAND TOTAL.....	20,468,535	15,151,336	35,619,871	5,877,219	41,354,105	52,684,805	135,536,000

Table 10

*Area Classification of Productive Forest by Tenure, Cover Types and Merchantability—Province of Manitoba*

Subdivision	AREA IN ACRES						TOTAL		
	Unmerch.	Merch.	Subtotal	Mixedwood	Hardwood	Subtotal	Unmerch.	Merch.	Subtotal
<b>ACCESSIBLE AREA</b>									
<b>INACCESSIBLE AREA</b>									
Provincial Crown Cruised.....	5,405,075	6,388,009	11,793,084	2,155,541	2,515,435	4,750,976	639,219	1,213,960	8,199,835
Federal Crown Cruised.....	11,846	32,468	44,314	16,619	86,724	103,343	97,776	126,241	452,529
Patented Crown Cruised.....	70,716	41,128	111,844	74,453	60,495	134,948	152,377	101,933	297,546
<b>SUBTOTAL.....</b>	<b>5,487,637</b>	<b>6,461,605</b>	<b>11,949,242</b>	<b>2,246,613</b>	<b>2,742,654</b>	<b>4,989,237</b>	<b>889,372</b>	<b>1,649,230</b>	<b>2,538,602</b>
Provincial Crown Uncruised.....	93,923	19,972	113,895	123,708	36,392	160,100	269,573	121,492	391,065
Indian Reserve Uncruised.....	46,608	46,917	93,525	25,167	24,171	49,338	13,944	10,999	24,943
Patented Uncruised.....	218,705	52,226	270,931	288,114	95,151	383,265	627,721	317,792	945,513
<b>SUBTOTAL.....</b>	<b>359,236</b>	<b>119,115</b>	<b>478,351</b>	<b>155,714</b>	<b>436,984</b>	<b>592,703</b>	<b>911,238</b>	<b>450,283</b>	<b>1,361,521</b>
<b>TOTAL ACCESSIBLE.....</b>	<b>5,846,873</b>	<b>6,580,720</b>	<b>12,427,593</b>	<b>2,683,602</b>	<b>2,898,368</b>	<b>5,581,970</b>	<b>1,800,610</b>	<b>2,099,513</b>	<b>3,900,123</b>
<b>PROVINCE OF MANITOBA</b>									
Provincial Crown Cruised.....	7,206,064	2,810,678	10,016,742	1,533,840	612,328	2,146,038	1,363,113	137,756	1,500,869
Indian Reserves Uncruised.....	24,569	9,574	34,143	5,223	2,084	7,307	4,641	415	5,056
<b>TOTAL INACCESSIBLE.....</b>	<b>7,230,633</b>	<b>2,820,252</b>	<b>10,050,885</b>	<b>1,539,063</b>	<b>614,312</b>	<b>2,153,375</b>	<b>1,367,754</b>	<b>138,171</b>	<b>1,505,925</b>
Total Cruised.....	12,693,701	9,272,283	21,965,984	3,780,453	3,354,882	7,135,335	2,252,485	1,786,986	4,039,471
Total Uncruised.....	383,805	128,689	512,494	442,212	157,798	600,010	915,879	450,698	1,366,577
<b>GRAND TOTAL.....</b>	<b>13,077,506</b>	<b>9,400,972</b>	<b>22,478,478</b>	<b>4,222,665</b>	<b>3,512,680</b>	<b>7,735,345</b>	<b>3,168,364</b>	<b>2,237,684</b>	<b>5,406,048</b>
Crown Lands.....	12,716,908	9,251,127	21,968,035	3,829,708	3,330,779	7,160,487	2,369,681	1,806,545	4,176,226
Indian Reserves.....	71,177	56,491	127,685	30,390	26,255	56,645	18,585	11,414	29,999
Patented.....	289,421	93,354	382,775	36,567	155,646	518,213	780,098	419,725	1,199,823
<b>GRAND TOTAL.....</b>	<b>13,077,506</b>	<b>9,400,972</b>	<b>22,478,478</b>	<b>4,222,665</b>	<b>3,512,680</b>	<b>7,735,345</b>	<b>3,168,364</b>	<b>2,237,684</b>	<b>5,406,048</b>

Table 11

*Summary of Merchantable Volume by Cover Types—Province of Manitoba*

Subdivision	VOLUME IN CUNITS (100 Cubic Foot Units)			
	Softwood	Mixedwood	Hardwood	TOTAL
ACCESIBLE FOREST				
PROVINCIAL CROWN				
Cruised.....	43,158,457	20,662,846	8,557,936	72,379,239
Uncruised.....	119,832	218,352	728,952	1,067,136
TOTAL PROVINCIAL CROWN.....	43,278,289	20,881,198	9,286,888	73,446,375
FEDERAL CROWN				
Riding Mountain National Park Cruised.....	334,692	1,032,575	4,222,153	5,589,420
TOTAL FEDERAL CROWN.....	334,692	1,032,575	4,222,153	5,589,420
INDIAN RESERVES				
Uncruised.....	331,379	170,405	77,542	579,326
TOTAL INDIAN RESERVES.....	331,379	170,405	77,542	579,326
PATENTED LAND (All Forest Sections)				
Cruised.....	196,692	201,467	376,325	774,484
Uncruised.....	313,356	570,906	1,906,752	2,791,014
TOTAL PATENTED LAND.....	510,048	772,373	2,283,077	3,565,498
TOTAL ACCESSIBLE.....	44,454,408	22,856,551	15,869,660	83,180,619
INACCESSIBLE FOREST				
Provincial Crown Cruised.....	36,720,795	7,863,404	1,965,777	46,549,976
Indian Reserves Uncruised.....	55,135	11,983	2,386	69,504
TOTAL INACCESSIBLE.....	36,775,930	7,875,387	1,968,163	46,619,480
PROVINCE OF MANITOBA				
Cruised.....	80,410,636	29,760,292	15,122,191	125,293,119
Uncruised.....	819,702	971,646	2,715,632	4,506,980
GRAND TOTAL.....	81,230,338	30,731,938	17,837,823	129,800,099
PER CENT.....	62.6	23.7	13.7	100.0

**Table 12**

*Softwood and Hardwood Volume by Tenure and Size Classes—Province of Manitoba*

Subdivision	*VOLUME IN CUNITS (100 Cubic Foot Units)							
	Softwood			Hardwood			TOTAL	
	4" - 9" D.B.H. <sup>†</sup>	10" + D.B.H. <sup>†</sup>	TOTAL	4" - 9" D.B.H. <sup>†</sup>	10" + D.B.H. <sup>†</sup>	TOTAL	4" - 9" D.B.H. <sup>†</sup>	10" + D.B.H. <sup>†</sup>

ACCESSIBLE FOREST

PROVINCIAL CROWN									
Cruised.....	46,308,329	9,152,857	55,461,186	12,050,281	4,867,772	16,918,053	58,358,610	14,020,629	72,379,239
Uncruised.....	183,249	121,899	305,148	553,715	208,273	761,988	736,964	330,172	1,067,136
TOTAL PROVINCIAL CROWN.....	46,491,578	9,274,756	55,766,334	12,603,996	5,076,045	17,680,041	59,095,574	14,350,801	73,446,375
FEDERAL CROWN									
Riding Mountain National Park									
Cruised.....	191,690	697,250	888,940	1,136,490	3,563,990	4,700,480	1,328,180	4,261,240	5,589,420
TOTAL FEDERAL CROWN.....	191,690	697,250	888,940	1,136,490	3,563,990	4,700,480	1,328,180	4,261,240	5,589,420
INDIAN RESERVES									
Uncruised.....	356,532	70,234	426,776	106,448	46,112	152,560	462,980	116,346	579,326
TOTAL INDIAN RESERVES.....	356,532	70,234	426,776	106,448	46,112	152,560	462,980	116,346	579,326
PATENTED LAND (All Forest Sections)									
Cruised.....	310,071	58,073	368,144	272,533	133,807	406,340	582,604	191,880	774,484
Uncruised.....	548,215	249,769	797,984	1,324,312	668,718	1,993,030	1,872,527	918,487	2,791,014
TOTAL PATENTED LAND.....	858,286	307,842	1,166,128	1,596,845	802,525	2,399,370	2,455,131	1,110,367	3,565,498
TOTAL ACCESSIBLE	47,898,086	10,350,082	58,248,168	15,443,779	9,488,672	24,932,451	63,341,865	19,838,754	83,180,619

INACCESSIBLE FOREST

Provincial Cruised.....	32,057,540	8,657,682	40,715,222	4,888,866	945,888	5,834,754	36,946,406	9,603,570	46,549,976
Indian Reserves									
Uncruised.....	51,144	11,549	62,693	5,481	1,330	6,811	56,625	12,879	69,504
TOTAL INACCESSIBLE	32,108,684	8,669,231	40,777,915	4,894,347	947,218	5,841,565	37,003,031	9,616,449	46,619,480

PROVINCE OF MANITOBA

GRAND TOTAL.....	80,006,770	19,019,313	99,026,083	20,338,126	10,435,890	30,774,016	100,344,896	29,455,203	129,800,099
PER CENT.....	80.8	19.2	100.0	66.1	33.9	100.0	77.3	22.7	100.0

\*Net roundwood volume; stump height one foot, top diameter 3 inches.

†D.B.H. is an abbreviation for diameter at breast height; trees are measured outside the bark at 4½ feet above the ground.

**Table 13**  
*Volume by Species—Cubic Measure—Province of Manitoba*

Species	VOLUME IN C.U.NITS (100 Cubic Foot Units)						GRAND TOTAL FOR PROVINCE	PER CENT		
	Accessible Forest			Inaccessible Forest						
	Provincial Crown Cruised	Federal Cruised only	Indian Reserve Uncruised only	Patented Cruised	Provincial Crown Cruised	Indian Reserve Uncruised				
White spruce.....	10,770,259	253,273	618,704	256,104	89,376	662,327	6,075,782	11,383		
Black spruce.....	36,203,772	28,989	154,676	31,653	147,021	75,808	27,678,000	40,401		
Balsam fir.....	3,138,121	6,103	53,330	24,852	65,111	15,960	1,550,665	26,641,919		
Jack pine.....	14,592,411	15,257	62,230	108,348	49,207	39,809	5,410,775	3,320		
Tamarack.....	655,022	1,526	.....	5,809	15,927	3,990	.....	14,867,352		
Cedar.....	101,601	.....	.....	1,502	.....	.....	.....	5,419,364		
<b>Total Softwood.....</b>	<b>35,461,186</b>	<b>305,148</b>	<b>888,940</b>	<b>426,766</b>	<b>368,144</b>	<b>797,984</b>	<b>40,715,222</b>	<b>62,693</b>		
Aspen Poplar.....	11,050,304	518,914	3,948,402	112,349	245,262	1,357,253	3,826,564	4,419		
Balsam poplar.....	3,562,801	70,103	564,058	18,289	136,688	183,359	373,012	437		
White birch.....	2,269,673	54,863	188,020	18,416	24,390	143,498	1,635,178	1,955		
Others.....	35,275	118,108	.....	3,506	.....	308,920	.....	465,809		
<b>Total Hardwood.....</b>	<b>16,918,053</b>	<b>761,988</b>	<b>4,700,480</b>	<b>152,560</b>	<b>406,340</b>	<b>1,993,030</b>	<b>5,834,754</b>	<b>6,811</b>		
<b>TOTAL ALL SPECIES.....</b>	<b>72,379,239</b>	<b>1,067,136</b>	<b>5,589,420</b>	<b>579,326</b>	<b>774,484</b>	<b>2,791,014</b>	<b>46,549,976</b>	<b>69,504</b>		
<b>PER CENT.....</b>	<b>55.8</b>	<b>0.8</b>	<b>4.3</b>	<b>0.4</b>	<b>0.6</b>	<b>2.2</b>	<b>35.8</b>	<b>0.1</b>		
								<b>64.1</b>		
								<b>35.9</b>		
								<b>100.0</b>		
								<b>100.0</b>		

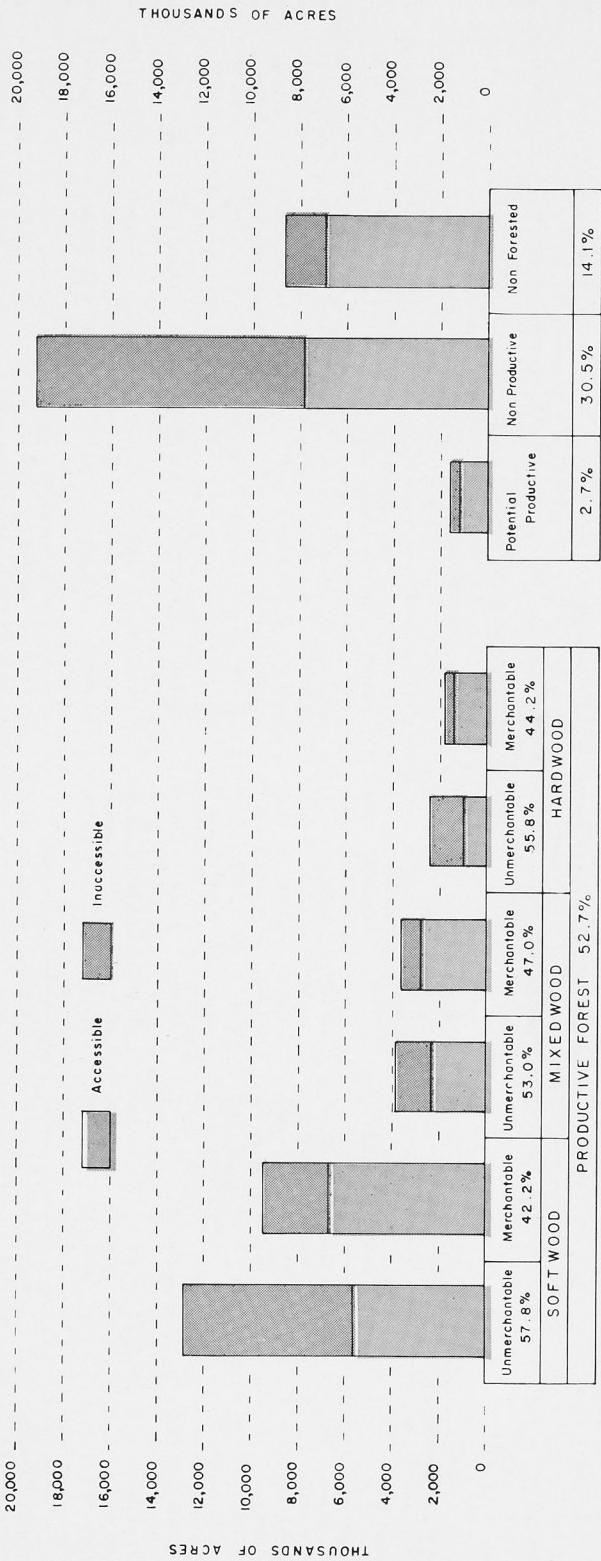
Table 14.

## Saw-Timber Volume by Species—Province of Manitoba

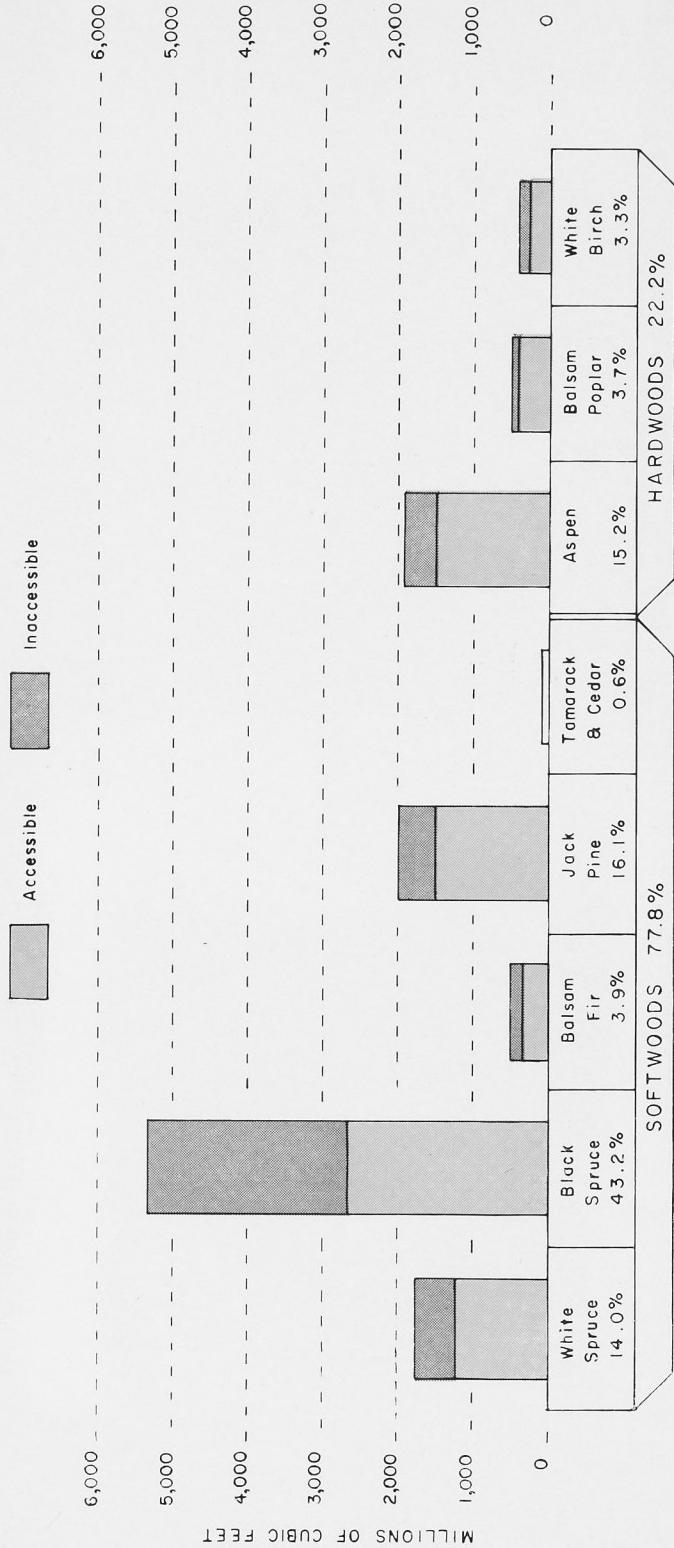
Species	*VOLUME IN THOUSANDS OF BOARD FEET										Per Cent
	Accessible Forest			Patented			Inaccessible Forest			Grand Total for Province	
	Provincial Crown	Federal Cruised	Indian Reserve Uncruised	Cruised	Uncruised	Provincial Crown	Crown Cruised	Indian Reserve Uncruised	Total Volume for Inaccessible Forest		
White spruce.....	2,432,275	52,655	263,926	18,166	14,453	106,104	1,687,750	2,210	2,907,579	4,597,539	34.4
Black spruce.....	706,462	770	7,886	4,504	4,713	2,320	1,624,686	2,124	726,655	2,353,465	17.6
Balsam fir.....	212,603	401	16,404	1,563	2,618	639	118,734	187	234,228	118,921	353,149
Jack pine.....	1,005,628	1,009	21,965	6,586	3,930	3,268	464,787	676	1,042,386	465,463	1,507,849
Tamarack.....	7,780	19	.....	540	262	65	.....	.....	8,666	.....	8,666
Cedar.....	9,954	.....	.....	.....	157	.....	.....	.....	10,111	.....	10,111
<b>Total Softwood.....</b>	<b>4,394,702</b>	<b>54,854</b>	<b>310,181</b>	<b>31,359</b>	<b>26,133</b>	<b>112,396</b>	<b>3,895,957</b>	<b>5,197</b>	<b>4,929,625</b>	<b>3,901,154</b>	<b>8,830,779</b>
Aspen poplar.....	1,488,736	66,084	1,173,999	13,718	38,353	219,875	280,057	377	3,000,785	280,434	3,281,219
Balsam poplar.....	478,812	10,126	167,714	4,081	5,867	27,559	28,194	37	69,159	28,231	722,390
White birch.....	250,055	6,395	55,905	1,846	15,994	24,409	117,398	185	354,604	117,583	472,187
Others.....	3,313	11,118	.....	.....	29,080	.....	.....	.....	43,511	.....	43,511
<b>Total Hardwood.....</b>	<b>2,220,936</b>	<b>93,723</b>	<b>1,397,618</b>	<b>19,645</b>	<b>60,214</b>	<b>300,923</b>	<b>425,649</b>	<b>599</b>	<b>4,093,059</b>	<b>426,243</b>	<b>4,519,307</b>
<b>TOTAL ALL SPECIES.....</b>	<b>6,615,638</b>	<b>148,577</b>	<b>1,707,799</b>	<b>51,004</b>	<b>86,347</b>	<b>413,319</b>	<b>4,321,605</b>	<b>5,793</b>	<b>9,022,684</b>	<b>4,327,402</b>	<b>13,350,086</b>
<b>PER CENT.....</b>	<b>49.5</b>	<b>1.1</b>	<b>12.8</b>	<b>0.4</b>	<b>0.6</b>	<b>3.1</b>	<b>32.4</b>	<b>0.1</b>	<b>67.6</b>	<b>32.4</b>	<b>100.0</b>

\*Trees 10 inches and over in diameter at breast height converted to board measure.

**Figure 1**  
*Classification of Accessible and Inaccessible—Cruised Areas*



**Figure 2**  
*MERCHANTABLE VOLUME BY SPECIES IN ACCESSIBLE AND  
 INACCESSIBLE-CRUTED AREA*



**DATE DUE SLIP**

SD 146 M3 M27 1956 NO-10  
MANITOBA FORESTRY BRANCH  
FOREST RESOURCES INVENTORY  
1956

39676272 SCI



\* 000013776174 \*

SD 146 M3 M27 1956 no.10  
Manitoba. Forestry Branch  
Forest resources inventory,  
1956 :

39676272 SCI

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